THE

JOURNAL OF GAS LIGHTING,

WATER SUPPLY, & SANITARY IMPROVEMENT.

VOL. XX. No. 495—23RD YEAR.] LONDON, SEPTEMBER 26, 1871. [Subscription per Annum. { 15s. in Advance. / 18s. Credit.] Price 6d. Unstamped.

RAMSAY'S NEWCASTLE CANNEL COAL. Analysis—10,000 cubic feet of gas per ton of coal; 26-candle gas; 13¼ cwt. coke per ton of coal.

RAMSAY'S PATENT CONDENSED COKE.

DO. GARESFIELD COKE.

RAMSAY'S FIRE-CLAY ARTICLES.

GAS-RETORTS, introduced 1828. FIRE-BRICK WORKS, established 1804. FIRE-CLAY SANITARY PIPES, CHIMNEY-TOPS, and all Goods made of Fire-Clay. The Fire-Clay is worked from Blaydon Main Colliery, is of excellent quality, and no expense spared in perfecting every article. The FIRE-BRICKS (marked "RAMSAY") are to be seen in all parts of the world, and the Works are the most extensive in the Kingdom.

Manufactories—Derwenthaugh, Swalwell, and Hebburn Quay, near Newcastle-on-Tyne; and London Wharves—Falcon Wharf, No. 80, Bankside; and Honduras Wharf, Cubit Town. Large stocks kept.

Address G. H. RAMSAY, NEWCASTLE-ON-TYNE.

GEORGE GLOVER & CO.,

Patentees of the Standard Gasometers for the Government, and of the

IMPROVED DRY GAS-METERS.

These Meters are warranted to measure correctly and not to vary. Their acknowledged superiority has brought them into general use more rapidly than any Meters hitherto manufactured.

To meet the increasing demand, G. GLOVER AND CO. have just entered on possession of extensive premises adjoining their present Works in Ranelagh Road, and they are now prepared to execute promptly, orders to any extent. They keep in stock all sizes of Meters up to 200 lights. In cases of haste, on the receipt of a telegram early on one day, their Meters can be delivered next day in any part of England, and in the large towns in Scotland.

Particulars and lists of prices forwarded on application to—

RANELAGH ROAD, PIMLICO, LONDON, S.W.;

236, GEORGE STREET, GLASGOW;

OR

15, MARKET STREET, MANCHESTER.

COWEN'S PATENT FIRE-CLAY RETORTS.

JOSEPH COWEN and CO.,

BLAYDON BURN, NEAR NEWCASTLE-ON-TYNE,

Were the only parties to whom a PRIZE MEDAL was awarded at the GREAT EXHIBITION of 1851, for "GAS-RETORTS and OTHER OBJECTS in FIRE-CLAY," and they have also been awarded in the INTERNATIONAL EXHIBITION of 1862, the PRIZE MEDAL for "GAS-RETORTS, FIRE-BRICKS, &c., for EXCELLENCE of QUALITY."

J. C. and Co. have been for many years the most extensive Manufacturers of Fire-Clay Retorts in the United Kingdom; and orders for Fire-Clay Retorts of all shapes and dimensions, Fire-Bricks, and every other article in Fire-Clay, are promptly executed at their Works as above.

COWEN'S GARESFIELD COALS.
Coal Office,
QUAY SIDE, NEWCASTLE-ON-TYNE.

JOHN RUSSELL AND CO.,

THE OLD TUBE-WORKS, WEDNESBURY;

AND

THE ALMA WORKS, WALSALL,

Established at the commencement of Gas Lighting.

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69, UPPER THAMES STREET; COMMERCIAL STREET, SPITALFIELDS; 5, CHARLES STREET, SOHO; and 16, SOHO SQUARE, } LONDON

35, 36, 37, & 39, GRANBY ROW, MANCHESTER.

J. R. and Co. are the original manufacturers of Wrought-Iron Gas Tubes and Fittings, and Inventors of the LAP-WELDED TUBES for Locomotive and Marine Boilers.

J. R. and Co. make all kinds of Tubes and Fittings for Gas, Steam, and Water; Gun-Metal Cocks, Stocks, and Dies; Galvanized Tubes and High-Pressure Tubes, &c.

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JOHN BENT & SON,

WET AND DRY GAS-METER

AND

STREET-LAMP

MANUFACTURERS,

BELL BARN ROAD, BIRMINGHAM.

ESTABLISHED 1830.

All materials found for the alteration of Public Lamps for lighting with the Rod. Regulators with Lava Burners.

BLAYDON BURN AND LOW BENWELL FIRE-CLAY RETORT AND FIRE-BRICK WORKS,

NEAR NEWCASTLE-ON-TYNE.

WILLIAM COCHRAN CARR begs most respectfully to thank the Metropolitan, Provincial, and Continental Gas Companies for their patronage for several years past, and to intimate that he has rebuilt and enlarged his extensive premises for the manufacture of CLAY RETORTS; and that he is now prepared to execute the largest orders with punctuality and despatch. Orders for FIRE-CLAY RETORTS, of all shapes and sizes, FIRE-BRICKS, and all other articles in Fire-Clay, executed on the shortest notice, and on the most reasonable terms.

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SCOTTISH CANNEL COAL.

J. & W. ROMANS, Consulting Gas Engineers and Coal Factors, of Edinburgh and London, CONTRACT for supplying any quantity of COAL and CANNEL.

They are also Contractors for leasing Gas-Works, for supplying, erecting, or repairing gas apparatus and fire-clay goods.

Messrs. ROMANS, being lessees of several Gas-Works, have their Cannels tested in the ordinary working process, thus securing for their customers a guarantee beyond mere laboratory experiments.

Analysis, prices, and other information will be forwarded on application to their Offices, 8, Forth Street, EDINBURGH; 1, Walbrook, Mansion House, LONDON, or to the "Crown Wharf," Thomas Street, Limehouse, LONDON, where stocks of house, steam, and gas coal are always on hand.

Coal, machinery, fire goods, &c., shipped to all parts of the world.

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AUCHINHEATH COLLIERY,

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LESSEES SINCE 1832.

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CONTINENTAL AGENTS:

LA COUR & WATSON,

LEITH.

CROLL'S DRY GAS-METER,

PRIZE MEDALS.

LONDON, 1851;
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PARIS, 1855.

(INVENTED & PATENTED IN 1844,)

COMBINING ALL THE LATEST IMPROVEMENTS,

MANUFACTURED ONLY BY

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LONDON, 1862;
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THE GAS-METER COMPANY, LIMITED,

238, KINGSLAND ROAD, LONDON, N.E.

MEDAL AWARDED, EXHIBITION, 1862, "FOR GOOD WORK."

THE IMPERIAL TUBE COMPANY, BIRMINGHAM,

MANUFACTURERS OF

WROUGHT-IRON TUBES & FITTINGS, BRASS & COPPER TUBES,

GALVANIZED & GLASS ENAMELLED TUBES & FITTINGS,

LAP-WELDED IRON & BRASS BOILER-TUBES, ETC., ETC.

Twyere Coils for Blast Furnaces, Boring Tubes, Core Bars, Gun-Metal and other Cocks, Boiler Mountings, &c.

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FOR GAS, STEAM, AND WATER;
STEAM-COCKS, AND ALL KINDS OF GAS-JOINTS.
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COOMBS WOOD PATENT TUBE-WORKS.
OLD HILL, near DUDLEY,
MANUFACTURERS OF
HOWARD'S PATENT IMPROVED WROUGHT-IRON TUBES,
FOR GAS, STEAM, AND WATER;
Also **ORDINARY WELDED WROUGHT-IRON TUBES and FITTINGS,**
FOR GAS, STEAM, & WATER, EITHER BLACK, GALVANIZED, OR ENAMELLED.
CORE BARS FOR IRONFOUNDERS, STOCKS, TAPS, AND DIES, IRON COCKS, &c.
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SILVER MEDAL, PARIS EXHIBITION, 1867.
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ALBION TUBE-WORKS, BIRMINGHAM,
MANUFACTURERS OF
WROUGHT-IRON TUBES AND FITTINGS
For Gas, Steam, Water, &c.
SOLE LICENSEES AND MANUFACTURERS for the United Kingdom of
THE LAVENANT PATENT ENAMELLED TUBES AND FITTINGS.
LAP-WELDED IRON & HOMOGENEOUS METAL TUBES
For Locomotive, Marine, and Stationary Boilers.
Boiler-Tube Ferrules, Gun-Metal Gland Cocks, Water-Gauges, Whistles, &c.; Stocks, Taps, and Dies for Screwing, and Gas-Fitters Tools of all kinds.
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WILLIAM INGHAM AND SONS,
WORTLEY FIRE-BRICK AND RETORT WORKS,
Near

Leeds.
W. INGHAM and SONS, having for many years been extensively engaged in the Manufacture of
RETORTS AND FIRE-BRICKS FROM THE CELEBRATED WORTLEY FIRE-CLAY,
beg to call especial attention to their RETORTS, which have for many seasons proved to be unsurpassed in quality by any in the Kingdom, their FREEDOM FROM CRACKS and the ADHESION OF CARBON rendering them worthy the attention of all parties interested in the making of Gas.
The Works are of such magnitude as to ensure the prompt execution of orders to any extent.
Estimates for Setting, or Bricklayers sent when required.
GAS OVENS IN SEGMENTS OF EQUAL QUALITY.
A large Stock of Fire-Bricks, Fire-Clay, Terra Cotta, and Drain-Pipes of all Sizes kept in London at Mr. ALFRED WILLIAMS, Wharf, 64, Bankside, Southwark, where all particulars of Prices, &c., may be obtained.
N.B.—*Export orders continue to have prompt attention.*

TRADE MARK.

THE MEDAL FOR 1862.
The only Prize Medal awarded for TUBES & FITTINGS.
CROWN TUBE-WORKS,
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WAREHOUSE: SOUTHWARK STREET, LONDON.

JAMES RUSSELL & SONS, LIMITED,
PATENTEES & FIRST MAKERS OF WROUGHT-IRON TUBES,
ONLY MAKERS OF HOMOGENEOUS METAL TUBES.
MANUFACTURERS OF
TUBES and FITTINGS for GAS, STEAM, and WATER;
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GAS-FITTERS TOOLS, VALVES, COCKS, &c.

THOMAS PIGGOTT & CO.,

(Established 1822,)

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MANUFACTURERS OF

TELESCOPIC & SINGLE GASHOLDERS,

CAST & WROUGHT IRON TANKS FOR DITTO;

PURIFIERS, CONDENSERS, SCRUBBERS, RETORTS, VALVES;

IMPROVED WROUGHT-IRON RETORT-LIDS, CROSS-BARS, & SCREWS;

AND GAS APPARATUS OF EVERY DESCRIPTION.

CAST AND WROUGHT IRON GIRDERS, BRIDGES, AND ROOFS,

STEAM-ENGINE BOILERS, & GENERAL WROUGHT-IRON WORK.

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ENGINEERS, WET AND DRY GAS-METER MANUFACTURERS,

BRASSFOUNDERS, & GAS APPARATUS MANUFACTURERS,

FOUNTAINBRIDGE WORKS, EDINBURGH.

SOLE MANUFACTURERS OF

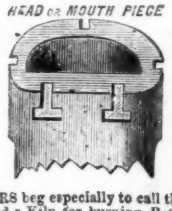
Peebles' Patent Wet and Dry Gas-Meters in Tin-Plate Cases, with Tongue and Groove Joints.

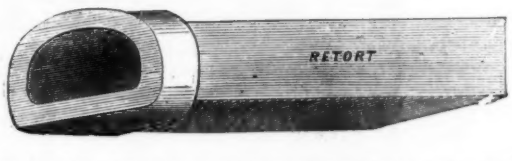
IMPROVED WET METERS IN CAST-IRON CASES.

STATION-METERS, GOVERNORS, EXPERIMENTING METERS, PHOTOMETERS, PRESSURE-GAUGES, &c.

KING BROTHERS,

STOURBRIDGE FIRE-BRICK AND RETORT WORKS.



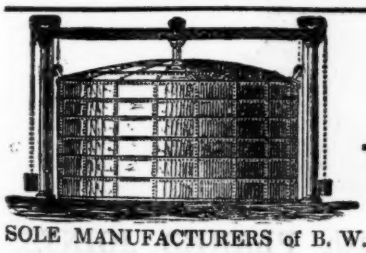


KING BROTHERS beg especially to call the attention of Gas Companies to the superiority of their Retorts, which are made from the celebrated STOURBRIDGE FIRE-CLAY. Mr. King has patented a Kiln for burning Retorts, by which Patent all Cold Air is excluded from the Kiln while burning, thus rendering them FREE FROM CRACKS AND CORRECT IN FORM. By great care in Manufacturing, combined with the advantages in burning, a VERY SMOOTH SURFACE is obtained, rendering them less liable to carbonize.

Retort Ovens, Fire-Bricks, Guards, Saddles, Rabbitted Burs, Flues, and Quarries, are all Manufactured of the same quality of Clay.

Every Retort and Brick is branded "King Brothers, Stourbridge."

Agent in Ireland—Mr. JAMES FURNESS, DOCTOR GARDENER STREET, DUBLIN.



IMPROVED GAS APPARATUS,

FOR CITIES, TOWNS, VILLAGES, &c.,

INVENTED AND MANUFACTURED BY

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WHITESTONE IRON-WORKS, HUDDERSFIELD.

SOLE MANUFACTURERS of B. W. THURSTON'S IMPROVED SCRUBBER, CONDENSER, and WASHER, in use in many of the principal Gas-Works on the Continent.

PATENTEES of the IMPROVED COMBINED PURIFYING APPARATUS, so eminently adapted for Exportation.

ESTIMATES, PLANS, and SPECIFICATIONS PREPARED for BUILDINGS and APPARATUS.

Prospectus, Price Lists, &c., on application.

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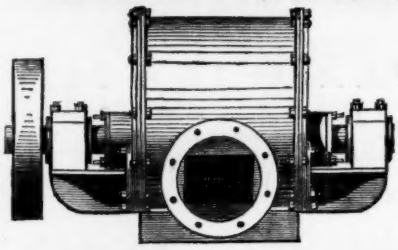
*** *Please address letters to Huddersfield.*

REFERENCES TO NEARLY 300 GAS-WORKS.

BEALE'S GAS-EXHAUSTER IMPROVED.



FROM 250 TO 250,000 CUBIC FEET PER HOUR.

Since Mr. BEALE'S retirement, the Oldest Makers are

J. BURTON, SONS, AND WALLER,

MAKERS OF ENGINES, MACHINERY, and IRONWORK for GAS-WORKS.

Efficient and durable TAR, LIQUOR, and SYPHON PUMPS.

GAS-VALVES in stock, 2 inches to 30 inches.

SELF-ACTING BYE-PASS VALVES, with Lid and Relieving Lever,

ROTATORY, TUMBLER, and CAPILLARY WATER DISTRIBUTORS for SCRUBBERS.

EXHAUSTERS from 3000 to 30,000 per hour in stock.

HOLLAND STREET, BLACKFRIARS, LONDON, S.E.,

Between Blackfriars' and Southwark Bridges.

LAMBERT BROTHERS, WALSALL.

ALPHA TUBE & FITTING WORKS

E. J. & J. PEARSON,

DELPH & TINTAM ABBEY FIRE-CLAY & BRICK WORKS,

STOURBRIDGE,

PROPRIETORS OF

BEST GLASS-HOUSE POT & CRUCIBLE CLAY;

MANUFACTURERS OF

GLASS-HOUSE POTS, CRUCIBLES, GAS-RETORTS, & FIRE-BRICKS OF EVERY DESCRIPTION.

WILLIAM & BENJAMIN COWAN,

WET & DRY GAS-METER MANUFACTURERS, BRASSFOUNDERS, &c.

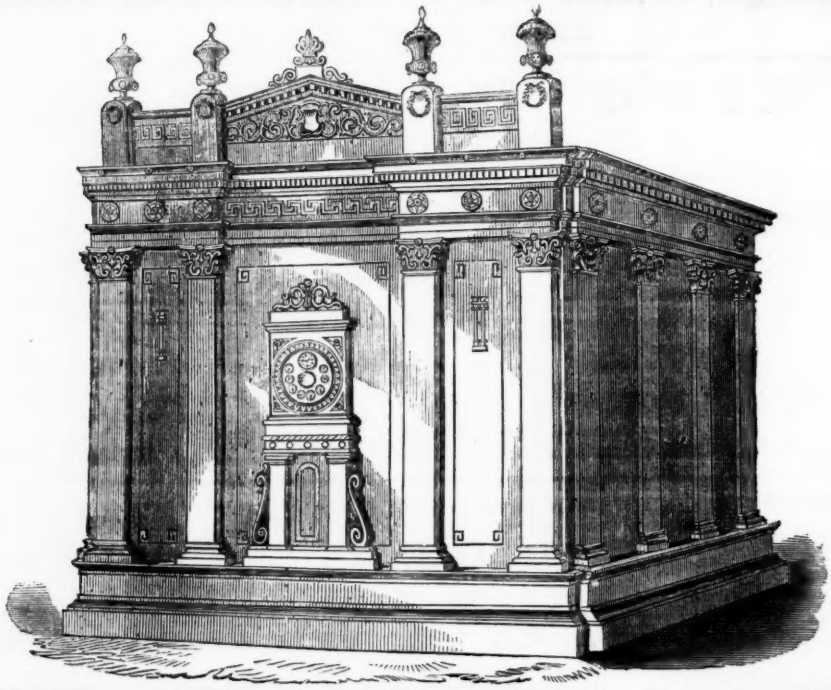
ESTABLISHED 1827.

Sole Manufacturers of ESSON'S PATENT COMPENSATING GAS-METER,

AND OF

COWAN'S PATENT SIDE-VALVE GAS-METER,

BUCCLEUCH STREET WORKS, EDINBURGH.



W. & B. COWAN'S SQUARE STATION-METER with PLANED JOINTS.

GOVERNORS, PRESSURE REGISTERS, TEST GASHOLDERS, GAUGES, &c.

W. & B. COWAN'S DRY GAS-METERS, in CAST-IRON CASES,

Possess a simplicity of construction and facility for repair greater than any yet produced, while the excellence of the material and workmanship, and accuracy of registration, cannot be surpassed. The superiority of their Dry Meters in Tin Cases is also well known, having stood the test of years.

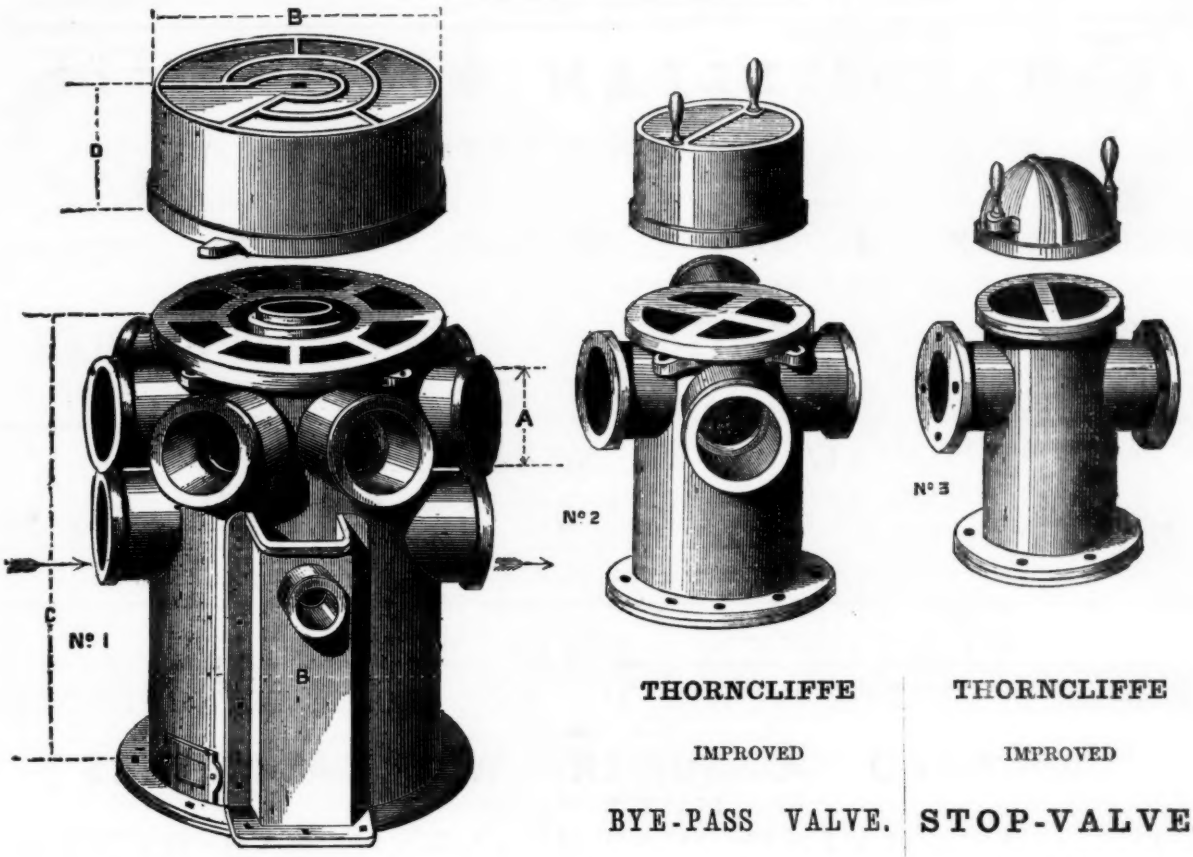
PRICE LISTS ON APPLICATION.

THE THORNCLIFFE IMPROVED CENTRE-VALVE,

MANUFACTURED BY

MESSRS. NEWTON, CHAMBERS, & CO.,

THORNCLIFFE IRON-WORKS, NEAR SHEFFIELD.



Sizes of the

THORNCLIFFE IMPROVED CENTRE-VALVE.

		Ins.	Ins.	Ins.	Ins.	Ins.	Ins.	Ins.	Ins.
A	Bore of Pipe...	4	5	6	7	8	9	10	12
B	Diam. of Body.	16	20	23	26	28	31	34	40
C	Height of Tank.	33	35	38	43	46	48	51	56
D	Depth of Cover.	8	9	10	11	12	13	14	16
	Total height...	41	44	48	54	58	61	65	72

THORNCLIFFE

IMPROVED

BYE-PASS VALVE.

SIZES

From 3 ins. upwards.

THORNCLIFFE

IMPROVED

STOP-VALVE.

SIZES

From 3 ins. upwards.

In all cases the Covers are cast heavy enough to resist any required pressure.

The advantages derived from the adoption of these Valves are so manifest and cardinal that in the immediate character of the change—the simplicity of the machine—the facility affording for cleaning out connexions between Valve and Purifier—the perfect collection and delivery by suitable overflow of the ammonia, at a greatly diminished depth from ground-line over the old form of Valve—the advantage of connecting on the same level, and at any angle, or opposite to each other, the inlet and outlet pipes without dip or rise—the clear acquisition of space in the purifying-house, by being able to place the boxes nearer together, the new Valve being entirely under the floor—and lastly, though of the greatest importance, the passage of crude and unpurified gas during the change is minimized to the merest fraction, thus preventing the fouling by impure gas the delicate machinery and easily affected exposed movements of the station-meter, thereby preventing the introduction of the enemy (unpurified gas) into the gasholder. Also a dead abutment is offered to all back pressure, imparting thereby to the gauges, governors, and hydraulic seals, a steadiness of action never realized with the once famous, but now fast becoming obsolete, Hydraulic Centre-Valve.

These Valves may be made of any size to suit any position of boxes, to stand any amount of pressure, warranted and tested with gas before leaving the manufactory, prepared to work any number of boxes in rotation—say, two, three, four, five, six, or eight—and for all Valves above 12-inch ports a suitable rack-and-pinion movement is attached if preferred. These Valves (specially arranged) are applicable to inlet or outlet pipes of gasholder, to act as Bye-pass Valves to meters, governors, exhauster, condensers, scrubbers, washers, driers, and duplicate systems of hydraulic main; also to act as Stop-Valves on special mains about the works. Where it is important no impediment be offered to tar or ammoniacal liquor, the same having uninterrupted flow to the general tar-well on the works, and for which purpose the slowly changed, often disordered, and at all times obstructive Slide-Valve (challenging the best of them) is superseded by the exceedingly simple, instantaneously changed Dome-Top Valve, which also carries so marked an index, whether open or shut, at any distance from close observation, providing the Valve can be seen at all. See sketch in perspective, No. 3.

London Office—34, LONDON WALL, MOORGATE STREET, E.C.

JOHN HALL & CO.,

STOURBRIDGE,

MANUFACTURERS of FIRE-BRICKS, LUMPS, & TILES,

AND EVERY DESCRIPTION OF FIRE-CLAY GOODS.

N.B.—A Stock of 15 and 16 in. CIRCULAR RETORTS always on hand. Other kinds made to order on short Notice.

PARIS, 1867.

CLASSES 24 and 53.

WILLIAM SUGG,

GAS ENGINEER.

LONDON, 1862.

CLASSES 13 and 31.

PUBLIC LAMP GOVERNORS, LEVER COCKS, AND POLE LIGHTERS,

LAMP METERS AND BOXES.

LOWE'S JET PHOTOMETERS CAN NOW BE RATED TO 14 CANDLES.

VINCENT WORKS, VINCENT STREET, WESTMINSTER, S.W.

C. & W. WALKER

CONSTRUCT THE LARGEST SIZED

GASHOLDERS, TELESCOPE AND SINGLE-LIFT,

Midland Iron-Works, Donnington, near Newport, Shropshire; 8, Finsbury Circus, London.

FLETCHER AND MURPHY,

GARRATT STREET WORKS, OLDHAM ROAD, MANCHESTER;

Manufacturers of

IMPROVED CONSUMERS WET GAS-METERS

IN CAST-IRON CASES,

THE UNVARYING WATER-LINE GAS-METER,

AND

IMPROVED DRY GAS-METERS;

STATION-METERS OF ALL SIZES, with PLANED JOINTS;

GOVERNORS, PRESSURE AND EXHAUST REGISTERS, TEST HOLDERS,

And all kinds of Experimental Gas Apparatus.

MESSRS. NEWTON, CHAMBERS, & CO.,

THORNCLIFFE IRON-WORKS AND COLLIERIES,

NEAR SHEFFIELD.

CELEBRATED SILKSTONE GAS COALS.

Analyses by F. J. EVANS, Esq., Chartered Gas Company, Horseferry Road, Westminster:—

(COPY.)

Description.	Cubic Feet of Gas per Ton of Coals.	Illuminating Power in Candles.	Coke per Ton of Coal used. Cwt.	Ash in Coke per Cent.	Sulphur in Coa per Cent.
Best Silkstone . .	10,900	17·0	12·8	2·6	1·7
Norfolk Silkstone . .	11,000	15·94	12·5	4·4	1·64
Silkstone Brights . .	11,500	14·5	12·6	7·4	1·85
Silkstone Nuts . .	10,800	15·85	12·66	6·0	0·69

NOTE.—The illuminating power of the Gas was tested by the standard burner now used in London by the Gas Referees, under the City of London Gas Act, 1868.

Horseferry Road, Westminster, March, 1870. (Signed) F. J. EVANS.

OFFICES, 34. LONDON WALL, CITY, E.C.

TANGYE BROTHERS & HOLMAN,

10, LAURENCE POUNTNEY LANE, LONDON, E.C.;

And BIRMINGHAM (TANGYE BROS.), CORNWALL WORKS, SOHO.

SOLE MAKERS OF

MORTON'S PATENT SELF-SEALING RETORT-LIDS,

WITH HOLMAN'S PATENT ECCENTRIC FASTENINGS.

Over 1000 of the Patent Retort-Lids and fastenings already supplied to the great works of The Gas Company at Beckton.

Several hundreds in use at the works of the London Gas Company.

FIG. 1.

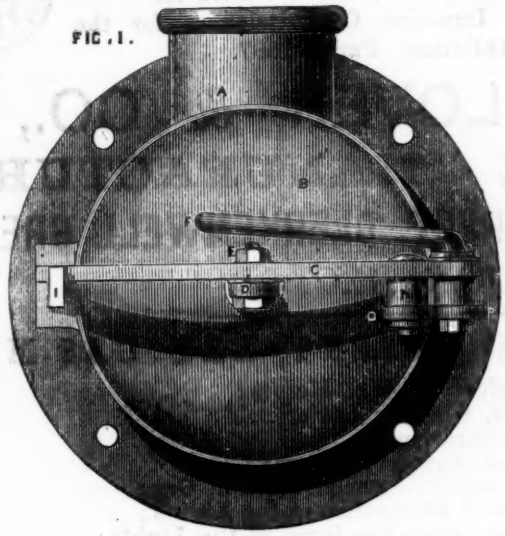
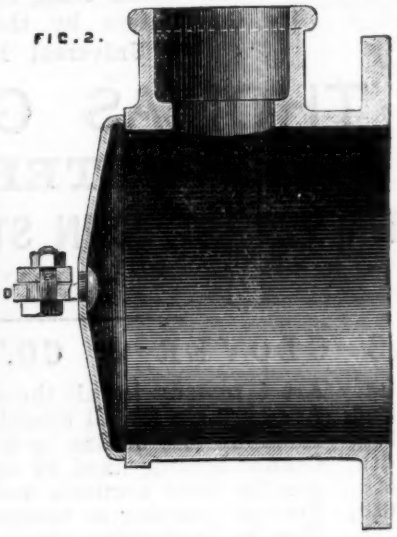


FIG. 2.



Adopted in the Gas-Works at

LIVERPOOL,
DUBLIN,
NOTTINGHAM,
ST. ALBANS,
BURSLEM,
BOURNEMOUTH,
WINDSOR,
BOSTON,
&c., &c.

THE "SPECIAL" STEAM-PUMP

IS THE

BEST PUMP FOR PUMPING AMMONIACAL LIQUOR, TAR, AND WATER IN GAS-WORKS

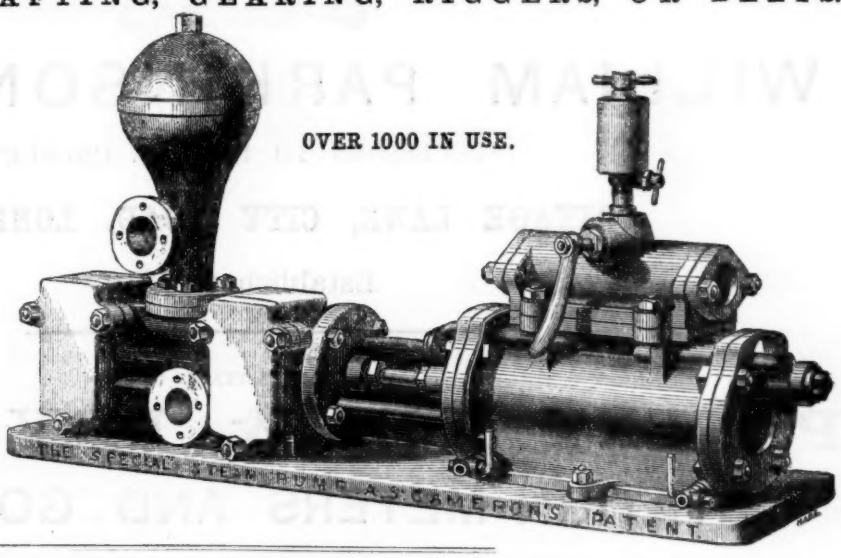
The "SPECIAL" Steam-Pump is adapted for all ordinary purposes for which Steam-driven Pumps are used. It is economical in first cost, occupies very little space, and the wear and tear is reduced to a minimum, because there is absolutely no extraneous gear.

REQUIRES NO SHAFTING, GEARING, RIGGERS, OR BELTS.

Adopted in the following Gas-Works:—

Aylesbury Gaslight and Coke Company.
Alliance and Dublin Gas Company.
Bolton Gas-Works.
Burslem and Tunstall Gas Company.
Brighton Gaslight and Coke Company.
Bury St. Edmund's Gas Company.
Burnley Gas Company.
Bradford Gaslight Company.
Corporation Gas-Works, Stockton.
Chartered Gas Company, Westminster.
Cork Gas-Works.
Dewsbury and Batley Gas Company.
Dublin Consumers Gaslight and Coke Company.
Dunstable Gas-Works.
Imperial Gas-Works, St. Pancras.
Ipswich Gas-Works.
Kingston-upon-Hull Gaslight Company
London Gaslight Company, Nine Elms
Lewes Gas-Works.
Louth Gas Company.
Middlesbro' Gas-Works.
Northampton Gas Company.
Phœnix Gas-Works, London.
Richmond Gas Company.
Rio de Janeiro Gas Company.
Reading Gas-Works.
Shipley Gas-Works, near Bradford.
St. Albans Gas-Works.
Sutton, Southcote, and Drypool Gas Company, Hull.
St. Helen's Gas Company, Lancashire.
Windsor Royal Gaslight Company.
Wandsworth and Putney Gas Company.
Woolwich Equitable Gas Company.
Western Gas-Works, Kensal Green.

OVER 1000 IN USE.



IMPORTANT TESTIMONIALS.

Manager's Office, Local Board Gas-Works, Middlesborough, March 19, 1868.

Dear Sirs,—In reply to your inquiry, I beg to say that the "Special" Steam-Pump, which you supplied to these works some months ago, has been at work ever since for pumping tar and ammonia water. I like it well, and am more than satisfied, for I am really pleased with its mode of doing double duty.

I am, very respectfully yours.

JOHN DUNNING, Manager.

Messrs. Tangye Brothers and Holman.

Richmond Gas Company, Manager's Office, Gas-Works, Richmond, June 17, 1868.

Dear Sirs,—I have the pleasure in stating that the three "Special" Steam-Pumps which we have in use—viz., one for water, one for pumping liquor through the scrubbers, and the other for filling tar barges, &c., are working well in every respect, and, I think, cannot be too highly recommended.

Yours truly,

JAMES ELDRIDGE, Manager.

Messrs. Tangye Brothers and Holman.

Sutton, Southcote, and Drypool Gas Company, Hull, May 1, 1871.

Gentlemen,—In reply to your note No. 410, April 29, I am very glad to inform you, that in a few hours after I got the pump started, and after I had written you, it did its work beautifully, and has continued to do so, throwing one day 4000 to 5000 gallons per hour, although you say 3250 gallons is its capacity. It is a splendid pump, the best I ever saw, and has just emptied a tank 82 feet diameter by 16 feet deep in 100 hours. I should have written to you some days ago had your note come earlier.—Yours truly,

F. W. OLDFIELD, Manager.

London, 1851. New York, 1853. Paris, 1855. London, 1862.

Dublin, 1865. Paris, 1867.

The SIX MEDALS AWARDED to THOMAS GLOVER for

PATENT DRY GAS-METERS,

The latter being the Highest Medal awarded for Dry Gas-Meters by the Imperial Commissioners for the Universal Exhibition, Paris, 1867.

THOMAS GLOVER & CO.,

DRY GAS-METER MANUFACTURERS,

214 TO 222, ST. JOHN STREET, CLERKENWELL GREEN,

LONDON, E.C.

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2nd, Are suitable for all climates, whether hot or cold;
3rd, Incur no loss of Gas by evaporation;
4th, Cannot become fixed by frost, however severe;
5th, Are the most accurate and unvarying measurers of Gas;
6th, Prevent jumping or unexpected extinction of the Lights;
7th, May be fixed either above or below the level of the Lights;
8th, Cannot be tampered with, without visibly damaging the outer case;
9th, Will last much longer than Wet Meters;
10th, Will not cost more than one-half for repair that Wet or Water Meters do;
Are upheld for five years without charge.

WILLIAM PARKINSON & CO.,

(SUCCESSORS TO SAMUEL CROSLEY,)

COTTAGE LANE, CITY ROAD, LONDON, E.C.

Established 1816.

MANUFACTURERS OF

PATENT WET & DRY METERS,

STATION-METERS AND GOVERNORS,

PRESSURE REGISTERS, GAUGES,

EXPERIMENTAL METERS, PHOTOMETERS, GASHOLDERS, &c., &c.

WATER METERS.

W. P. & Co. beg to state that they are now prepared to supply Station-Meters with planed joints.

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TO CORRESPONDENTS.

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THE JOURNAL OF GAS LIGHTING, WATER SUPPLY, & SANITARY IMPROVEMENT.

TUESDAY, SEPTEMBER 26, 1871.

Notes upon Passing Events.

The strike at Newcastle is more interesting, at the moment, in this country, than the progress of the sham campaign (although that is not to be despised), or the attempts of the French to cut off their own noses in order to spite the German commerce. We shall not fall into the ordinary groove of so many journalists at this time of the year, and offer advice to either masters or men that certainly will not be taken. They both well know what they are about, and the struggle would have come, and been just as desperate, in however polite a form the men had made their demand, or the masters refused it. It is absurd to imagine that the Newcastle employers were not perfectly well informed of what had passed in the secret conclaves of the men. It is quite impossible to keep the secrets of a discussing assembly. The remarkable feature about this struggle is that, unlike other strikes, it is not either for higher wages (unless indirectly—by increasing the hours when extra pay would be due), or on the principle of the first great strike of the Amalgamated Engineers, when they claimed that the boy or labourer who tended a self-acting machine should receive the full wages of the mechanic whose work was superseded by that machine. This strike is made in order to provide work for more men. If the work the engineers do is too much for the man's health who works ten hours, that is a matter of fact—thirty years ago the working hours of all skilled mechanics were twelve, as they still are on the Continent. But if the hours are to be limited in order to increase employment, there is no reason why the trades unions should not order workmen to use only one hand in order that a second workman may be employed to do the work of the left hand. This was almost done in the bricklaying trade while the building trade was flourishing. In its present depressed state, bricklayers are ready to "slope" the rules of the union for constant employment. No rational politician denies the right of men to combine to raise their wages, and to strike work if their demands are not granted; but then, what is sauce for the goose is sauce for the gander, and if a strike is commendable, why is a lock-out barbarous and brutal? If working men require the ballot in political voting, why should they object to it as a means of deciding a trade question, unless it is the inherent right of working men to employ a power they deny to landlords and employers—intimidation? According to the speeches of Socialists like Mr. Odger, the strike is directed against the Newcastle employers, not because wages ought to be increased, or hours diminished, but because they are rich. This is quite consistent with the principles of the International Society, which protests against all property and all accumulation of capital. According to Mr. Odger's principles, all capitalists are criminals—the honest men are the spend-thrifts. Mr. Odger, with foolish candour, took the instance of the late Mr. Brassey, who was reported to have left seven millions behind him; thus showing that it was not the application of the wealth, but the fact of possessing it, that was the crime. If any of the denouncers of the crimes of capital had taken their examples from the Blue-Book on Truck (which we shall presently notice), they would have hit an undoubted blot, although one shortly to be removed by the action of Parliament; but, although we should not think of setting up Mr. Brassey as a sample of an angel or a philanthropist, nothing but an imagination diseased by German Socialism could pick him out as an enemy of the working man. Mr. Brassey, who began life in a comparatively humble position, did not make his money by employing men at the lowest possible wages, but in an exactly contrary course. Having accumulated a small capital by his frugality, he devoted his life to the execution of great public works, which he was able to undertake on a larger scale than any one else, because his honesty and energy acquired him the confidence of those who had railways, docks, or canals to make; and his skill in choosing out of working men assistants, whom he highly paid, enabled him to place them either as superintendents or as sub-contractors all over the world. Perhaps there never was a man who, while making and increasing his own fortune, made the fortunes of so many working men. All his people were well paid. He did not believe in cheap labour. He remained in business long after he had ceased to care for any increase of wealth, in order to keep his assistants employed. And this is one of the criminals denounced by the International Society by its most eloquent organ, Mr. Odger. With such opinions it is impossible to argue. If those who hold them ever become strong enough, they will descend again into the streets, and in the name of Liberty imitate the crimes of the Bourbons of France, Spain, and Naples—shooting down those who differ from them. At the same time, the outside public is open to be convinced that ten hours is too much for a skilled mechanic to work.

If a strike had been initiated by the iron-workers of Scotland or of South Wales, against the truck system, it would certainly have carried with it the sympathy of every honest man not connected with those trades. The system of Truck or Tommy shops is founded on deferring the payment of wages for four or five weeks, and even longer. The Duke of Buccleuch only pays his miners once a year. During this time the majority of the workmen cannot live without advances. These advances are not directly, but by a sort of hocus-pocus, made in kind; for although the money is handed over to the workman, in order to evade the Truck Act, he is expected to there and then lay it all out in a shop, either the property of the iron-works or rented by some one paying a commission on the sales to the proprietors of the works. Thus, in one Welsh village, packets of tobacco are the principal circulating medium, purchased at a high price, and bartered away at a lower price for rent, for beer, or anything else the shop does not sell. The whole system rests on payments long deferred instead of payments weekly. In Wales the shop system was originally established when iron-works sprang up in remote valleys, and by no other mode could the working population be fed and clothed. There are hypocrites who pretend that truck and long payments are combined in order to protect the men from the temptation of drinking away their weekly money; but the Blue-Book evidence incontestably proves that the long-payment system and truck shop are maintained as very profitable sources of revenue. Two examples prove this. When Mr. Fothergill, who is the proprietor and manager of the Aberdare Iron-Works, decided to contest Merthyr with Mr. Home Secretary Bruce, on advanced Liberal principles, he found it necessary to give up his truck shop. Mr. Brogden, M.P. for Wednesbury, an ironmaster, and also an advanced Liberal in favour of a "large reduction and complete reform of the "national expenditure," is an owner of a truck shop, which he commenced by abolishing; but as he did not accompany this abolition by weekly payments, his unfortunate serfs were obliged to petition for the reopening of the shop, because it was better to take packets of tobacco at 1s. 2d., and resell them at 10d., than to be altogether without

money. So far has this system gone, that even where a subscription has been made to help a workman to bury a child, the pay-clerk has not only deducted commission, but compelled the bereaved father to take part of the money out of the shop. We shall take most of our extracts of evidence from the workmen, because the employers have never done more than profess ignorance of the doings of their servants by which they profited, or tried to show that the stores were not so profitable as represented. The cashier of Drumpellier Iron-Works, in Scotland, states the whole system in a very few words:—"There is "an understanding that when a man gets cash he should spend it "at the store. If a man made a practice of taking money away, "we should stop it altogether. Out of every 5s. paid me in "cash advances, 4s. come back through the store the same night. "The best men (who do not require advances) do not come to "the store." "We carry on," says the master, "the trade at "this advantage: we have no bad debts, and, purchasing in the "lowest market, we ought to be able to compete with anybody." The wife of a workman tells a very different story:—

My husband works for the Monkland Company. I have been 20 years in Chapel Hall, dealing in the stores nearly all the time. We lift our money almost every day, but are compelled to lay it down in the store as we get it. We go to the office and lift it from one man, and then lay it down to another man. That happens only to our advances, not as to the money we get on pay-days, which is free. The advances we are forced to spend at the store, every penny of them. If we take away 1s. out of 5s. our book is stopped immediately. The Thursday and Friday before last we were allowed to carry our money away free. I never heard of the like happening before for 20 years; but on the Saturday after, when I tried to take 5s., the storeman, David Strachan, said, "You recollect, Mrs. Gainor, that you must put up your book and money the day, as usual, for the rules are changed. You are not allowed any cash." Last Monday my book was stegged. There is a great difference between the stores and the shops. In the stores, when you take a quarter of a pound of tea you pay 11d.; but if a poor creature has to take it in separate ounces, they must pay 3d. for each ounce. They never acknowledge the farthings. The goods at the stores are worse than in the shops; tea, sugar, and every article. I have seen me getting butter that the dogs would not make use of. There was never, in my memory, liberty to take money out of the store till those two days I spoke of. You can buy for 2½d. in the shops better tea than the stores sell for 3d. By dealing with the private shops in Airdrie, I could save 4s. in every pound. At the store they do not give you fair play. When they give you your article they pitch it to you, as if you were a dog. They are sure of your money. They know that you must leave your line, and when they are putting the goods in the scale, they will knock it down on the counter, and never give it time to rise till they pop the article out of it and pitch it to you. You get no account of the odd farthings, and being obliged to take small quantities of articles, this causes a heavy loss every month. They keep some articles specially for what they call the gentry. I have seen them get what the storeman calls the best bread. I have seen a 6s. line sold for 5s.

William Dodds, a miner, says:

The next time I went was last May, when I had a boy died. The men gathered a subscription for me according to the rule in the pit when people were in trouble. The subscription came to £1 4s., but when I went to the clerk, he would only give me 12s. in cash, and a 12s. line, and nothing else, and I had to take that. The same month, about a fortnight afterwards, I had another boy that died. The men made another subscription on that occasion, which came to £1 1s. 6d. When I went to the clerk, he would give me nothing but a 15s. line, and 6s. in cash. I told the clerk the line did not answer me, it was money I was laying out. I had to keep my money in order to pay the funeral expenses. I wanted the money to bury my child, and I told the clerk so. He still declined to give it to me. He would not give it to me even on the pay-day. He said if I would not take the line, I might go and gather the money myself if I liked. He said it was all humbug, and he was not to be bothered by it. I must either take the 15s. in cash, and the lines, or want. He said if I had been regular in going to the store, he might have given it to me in cash.

J. Nicol says:

I am a lead miner at Wanlockhead. The works belong to the Duke of Buccleuch. I have been there nearly forty years, twenty-seven of them under the duke. We are paid once in the twelve months. We will be paid in the month of January, 1871, for the work done in 1869. We have a lie year, or rather a lie two years. Any regular money we get in the twelve months is 6s. in April, £2 in July, and £4 in October. The 6s. in April is seed-money, to buy seed for planting our plots of ground with corn or potatoes, or anything else. The £2 in July used to be called peat-money, but is now called coal-money. It is to buy fuel with.

An application to the duke to change this system met with a decided refusal. All other lead-mine proprietors pay once a month. No one complains of the duke's system—no one dares—but the best men have emigrated half a dozen at a time to the mining districts of the United States. D. Evans, working on the Ebbw Vale Works, in South Wales, says:

I am charged by a large majority of our men to tell the commission that the men do not wish the shop at all. We wish short pays, weekly pays if possible, and no draws whatever—no goods. We do not want Tommy from the shops. I passed the shop at half-past four last Monday, which was turn-book day, and I believe there were 50 women there at least. I believe my wife was kept six hours last Monday waiting to be served. She does not complain of the articles, but sometimes of the price. I believe the men very often pawn tobacco. They pay 1s. 4d. for a quarter of a pound, and get a shilling's worth of beer for it. I have not done so myself. There was a subscription for my mother-in-law, when we buried my sister-in-law, and I believe she had to take the chief part in goods, and her previous debt was deducted. The entry of "C. Williams, 8s.," means 8s. that was stopped off me for a debt of my wife when I married her. A debt of her first husband was kept off me, or some one else's debt. I could get no account of it, but it was put down to her. If we deal in the shop they are not willing to give us a fortnightly draw at all if we owe any debt in the shop. For the last four months the work has been slack for want of water, and the company have helped us with goods on account, without having work for them. I am working that off now.

J. M'Pherson, employed by a Scotch firm, has a bitter tale of hardship:

I was at Watson's till last December as a miner. I got dismissed for sloping the store. The manager told me so. One day my book was stopped. I went to see the reason, and asked 10s. of what was due to me. The wee clerk flung back the book to me again. I asked him what he did that for, and he said, "You took away the last, you are not to get any more." I did not know very well what to do, so I came out and stood there for a while. I had a wife and six weans in Ayrshire, and I thought it was rather hard that my money should be kept while they were wanting it, and they could not get it. I had money lying in the office at the time. I went in again, and the head cashier came in and said, "What the hell are you wanting here?" I said, "I am wanting cash." He said, "You will get none, you took away the last." I said, "Oh, but I will need to get it." Mr. Waugh was standing by; I said to him, "It is very hard that I should have plenty of money here, while my wife and weans are in Ayrshire, and I cannot get it to send them." He just stood and hung his head, and said nothing. I had about £1 lying, and I wanted one-half of it. I said, "I will try to do without it." I went to the advance clerk and got 30s. from him, and I posted it to my wife in the same way as I had done before. My wife was confined to bed at the time in consequence of having had a child. It was after that that the manager spoke to me. After that I had to take goods out of the store in order to maintain my family, and I sent them from Motherwell to Saltcoats, in Ayrshire, which is 40 miles distance by the train. I could get no money, and if I had sloped the store again I would have got my leave. I had either to take goods or do without anything, so I went and bought a bag for 1s., and put the goods into it, and sent them off to Ayrshire. I did that three times. I put some big loaves in, and butter, and sugar, and what not. This happened last December. It was the head manager who dismissed me. I used to get drink at Watson's without money. They did not give me a line for it; they just kept it off me at pay-day. We could get plenty of whisky without a line, but we could not get a loaf without one. If a man's wife was going down to the storeman and telling him that they were needing food, I have seen him deny it, and saying they could not get it, but if a man came down at the wife's back and asked for half a mutchkin, he would get it at once. This never happened to me. I cannot say anything further than that. That is what I heard the men saying.

There are many score pages of evidence of the same character. By this system drunkenness and improvidence are encouraged, and that by men who make a great pretence of religion and political philanthropy. One feeble, even if real, attempt to found a co-operative store is recorded. If the employers took one-tenth part of the pains to educate the people, afford them rational amusements, and encourage saving, that they do to force them into the truck shops, the whole character of the people would be changed; for it must be remembered that these great employers are in a position to exercise a paternal despotism. The great iron-making house of Baird (millionaires) allowed no truck, and paid, when wanted, in cash. At Nottingham, Mr. Mundella and the Morleys have put truck down; and even alongside these truck establishments in Wales and Staffordshire other great works with weekly pays are carried on successfully. The plea urged by some employers, that men would drink all their wages, if paid in money, is a disgrace to those who urge it. This is the sort of work which helps the visionary and confiscating schemes of Socialists. It must be put down.

The late Edward Denison, M.P. for Newark, and heir presumptive to the Speaker, who died very young, was a great loss to the House of Commons and his country. In a memoir of him that appears in the September number of "Macmillan's Magazine," are a few words of his on pauperism equally worth the attention of the wild sensational sentimentalists like Mr. Denison's friend, Mr. Auberon Herbert, and of Mr. Herbert's rival for the suffrages of the working men, Mr. Jenkins. Mr. Denison was not a mere platform philanthropist; he did not confine his sympathies to making speeches and getting up societies, in order to fly from them as soon as there was any work to do. He went and lived in the worst part of the east of London, and worked hard to raise paupers into the condition of independent bread-earners. The following was his idea of the principles on which the pauperism of England should be treated:—"*First, "we must so discipline and regulate our charities as to cut off the "resources of habitual mendicancy. Secondly, all who proclaim, by "begging, themselves destitute, must be taken at their word. They "must be taken into custody and kept at penal work, not for a day or "two, for a month or two—a proportion of their earnings being "handed to them on dismissal as capital to begin a life of honest "labour. Thirdly, we must promote the circulation of labour, and "obviate morbid congestion of labour in towns. Fourthly, we "must improve the condition of the agricultural labourer.*" These principles are equally opposed to the Gradgrinds who spout flatulent Liberalism and make incomes out of truck shops, and to the Conservative and Radical sentimentalists who, the moment an attempt is made to coerce mendicancy and improvidence, raise party cries of cruelty to the poor or robbery of the poor. According to Mr. Tallack, in a letter addressed to the *Times*, the Dutch have solved the question of vagrancy and pauperism on the principles laid down by Mr. Denison:

Habitual vagrants and determined paupers are arrested and sent to one or two large agricultural colonies in the east of Holland, and in particular to Fredericksoord, where they are compelled to earn their living. To each is allotted a shanty, a plot of ground, some tools and seeds, and some rough subsistence to start with. Opportunity is afforded of earning a plot of land by a few years of industry, and also of possessing a cow and a few pigs or sheep. But escape is carefully prevented, and no further preying upon the public is permitted, the system being one of limited imprisonment on a penal but beneficently reformatory colony. The effect is most excellent in the formation of honest habits and self-supporting lives. Such institutions are worthy of general study and imitation.

On the other hand, Mr. Tallack relates that destitute boys receive an education very different from that imparted in our ordinary workhouse schools and those charity schools which the parochial authorities of London seem so anxious to perpetuate.

There is comparatively little pauperism in Holland, and workmen of all descriptions find general employment, although wages are lower than in many other countries. One of the causes of this general occupation is to be found in the existence of institutions termed "Ambacht" schools, or technical schools for the children of the poor.

The one in Amsterdam gives instruction to 104 poor boys who are there taught in such a manner as to enable them, on leaving school, to earn wages at once by their practical and intelligent skill in various handicrafts. The hours of attendance are long, being from eight in the morning till eight in the evening, with a recess of two hours for dinner and recreation. Fourteen hours per week are devoted by each pupil to reading, writing, mathematics, geography, chemistry, electricity, and various branches of science; 16 hours per week to manual occupation at carpentry, smith's work, turning, telegraphy, &c., and 18 hours per week to drawing, designing, and sculpture. The full course of study extends over three years. The charge for each pupil is 15 guilders (25s.) per annum, paid partly by the parents and partly by the aid of subscriptions.

During the hours of labour the school presents a scene of much animation, when one sees in the large smith's shop a number of boys busy at their anvils and forges, and in other spacious apartments groups of young carpenters sawing, planing, and chiselling, while others, again, are actively turning the lathes, or intently engaged on various handicraft occupations.

There is also in Amsterdam a technical school for middle-class girls, where, for a payment of 20 guilders per annum (£1 13s. 4d.), they are taught the use of sewing-machines, &c., and to act as apothecaries or nurses, and are also instructed in drawing, music, and embroidery.

If the vicious system of supplementing wages by poor-law relief, or by the charity of competing religious societies, were discontinued, and the education contemplated by the London School Board carried out, we should not hear of paupers and semi-paupers refusing to migrate to counties where labour has remunerative demand. Mr. Edmund Holland writes to a contemporary:

I had written to an active and able relieving officer, through whose help the four families who have been successfully migrated to the North were sent off, to say that I had found a similar employment for another family, whose name I mentioned, and requesting him to arrange finally for their departure; and now I receive the information from him, in reply, that they "refuse to go." I wrote also for a list of a dozen families or so, suitable for Lancashire work. To-day I have received a list of 15 families. "I have had," says the relieving officer, "all the women in the enclosed list before me, and laid before them fairly the advantages they would derive from migrating northward. Those marked in the margin 'Yes' and 'No' are, respectively, willing or unwilling to go. The right side of the margin shows the amount of relief given to them in money and kind, which I believe to be the chief prevention to their consenting." I regret to say that 8 out of the 15 families refuse to go—prefer London pauperism to Lancashire independence. Let it not be supposed that idleness on the part of these poor people is the immediate or moving cause of this deplorable choice of theirs. The 15 families were specially selected for their industrious habits. The poor-law out-relief system, sir, is the cause. It has dragged down these poor wretches till they have lost the meaning of the word independence.

We need not be surprised at all this. It is an inevitable result of the out-relief system, the cruelty of which is all the greater from its being allowed to operate as against female, when its operation as against male labour has been put a stop to. The practice is well-nigh universal so to supplement the wages of widows and children, in London at least. Relief is not given to them exceptionally, but habitually in aid of wages. To such an extent is this the case that it is notorious that the usual question asked of an able-bodied widow, on her application for relief, is how she earns her living; and if she is unable to show that she does earn some living, in nine cases out of ten she is refused relief.

We can trace out the results. Female and juvenile labour is degraded to the dust in London, when all the time there is an active demand for that labour in Lancashire. We have now an opportunity to break through, at once and for ever, this wretched out-relief system by drafting off its poor victims to Lancashire, thus increasing the wages of those who remain behind, and enabling them to gain an independence even in London. No fewer than 33,000 persons (widows and children) are involved in this question in the metropolis alone.

If, however, an attempt were made to compel these unfortunates to improve their condition, we should have public meetings, and denunciations of the cruelty of the administrators of the poor-laws, in which the Conservative *Standard* and the Democratic *Lloyd's News* would heartily join hands to damage the Government that attempted so grand a reform.

The successful opening of the Mont Cenis Tunnel is remarkable as the third instance of an enterprise—the Suez Canal and the Atlantic Cable being the other two—on the inception of which our greatest engineers threw very cold water. In the Mont Cenis Tunnel the idea was purely Italian, but our English mechanics have contributed more to the success of Italian ideas than appears in the reports. The Mont Cenis Tunnel is another example of the difference between French professions and practices. The French are always reproaching the English with their egotism—otherwise selfishness—and claiming to work disinterestedly for the good of the world; but whenever it comes to a question of local interest against the interests of the world, French functionaries are ready to condescend to acts which public opinion would render impossible in England. To serve the Marseilles route, trains are delayed, and ten miles of railroad left unfinished. Individuals are as selfish in England as in France, but French public opinion approves what would be scouted by every gentleman in England, where those who are not gentlemen wish to be thought so. The success of the Mont Cenis Tunnel will be the precursor of other works for unlocking Switzerland and Italy to the traffic of Europe. While France was powerful, the St. Gothard route to Italy was vehemently opposed, because it would benefit Germany. Mr. George Hemans has reproduced a most enticing scheme, which only requires funds for its execution. The engineering fact of the Mont Cenis Tunnel has given a new impetus to schemes for a railroad to our Indian dependencies by the Euphrates or some other route, for which, under a Government guarantee at a low rate of interest, it will not be difficult to find the funds out of the accumulating savings of this country, let alone the rest of Europe.

A speech from Sir Edward Watkin (whose Manchester, Sheffield, and Lincolnshire line is now left out in the cold between those rival houses the Midland and Great Northern) has wakened into full cry the doctrinaires and briefless lawyers who are always seeking to multiply the number of appointments open to barristers of not less than five years standing. Sir Edward Watkin being, fortunately for the public, in the railway opposition, recommends that the Clearing-House system should be applied to passengers; that instead of competing lines, for instance, between London and Dover, Margate, and Ramsgate—fighting for each passenger—the holder of a ticket should have his choice of using, going, and returning by either of the two lines that serve that district. The idea is good, and, if seriously considered—especially when Nature removes from the great lines some of the conscript fathers who are opposed to every change—is likely to be worked out in spite of difficulties of detail. In the same direction is the amalgamation between the Lancashire and Yorkshire, which has no metropolitan terminus, and the London and North-Western, which has three, and is likely to have four. But when the advocates of Government management of railroads quote the amalgamation and Sir Edward Watkin's threatening speech as arguments in favour of Government railways and management, they leave out of sight some very important conditions. We might fairly say that neither the history of British artillery or small arms, nor of British dockyards, nor the accidents of the *Captain* and *Megæra*, give the public reason to put confidence in the Government management of undertakings so essentially progressive as railroads. The old argument as to the superiority of foreign railroads is given up; recent experience has sufficiently disgusted British tourists. The British public, as regards British railroads, with all their undoubted shortcomings, have one advantage over those who deal with German or French lines. They are under the pressure of public opinion, without regard to politics, and of Parliament, whenever a line has to ask favours. Ask the men whose registered letters have not been delivered, whose telegram has been mis-written and mis-sent, if they do not hunger and thirst for a substantial company on whom damages may be levied, whose managers must shrink from a damaging leading article. You can get *at* a board of directors, but who ever got *at* that inevitable monopoly and mysterious entity the Post-Office? But there is another question we should like to ask—When will be the proper time for buying up our railroads, and adding half a million to our functionaries? Twenty years ago the oracle of functionaries and doctrinaires proposed to buy up the railroad system. Where would it have been now, if in the hands of the Government authorities, who stuck to sailing vessels as long as they could, then to paddles instead of screws, and to wood instead of iron? We find no fault for this. A Government has no incentive, scarcely a right to be enterprising. Where is the Chancellor of the Exchequer to be found who would ask votes for branches, extensions, or new stations, without the direct necessity, in the face of a critical political opposition? We ask the candid public to compare a Bradshaw's map for 1851 and 1871, and decide whether any Ministry would have ventured on the expenditure from which the trading and travelling public have obtained two, three, and four lines, all in full work, to all our principal towns. Even since 1866, when Mr. Arthur Williams made his appearance with his scheme of Government acquisition and management, the metropolitan connexions, which affect the traffic of the whole country, have acquired extraordinary importance. No Chancellor of the Exchequer would ever have ventured to push on the Metropolitan District Line, or the Midland (St. Pancras) Terminus, and no House of Commons would have compelled the Great Eastern to push on to Broad Street. The old theory that too many railways have been made is quite given up. The fact is, these doctrinaire railway reformers propose to have their cake and eat their cake. To combine all the advantages of competition, controlling parliamentary supervision, private enterprise, on the one hand, and the economies which would undoubtedly result from one board, one set of officials, engineers, and lawyers on the other. All the grievances of travellers and senders of goods on foreign railways have to be borne in silence, except when some desperate Englishman writes to the *Times*, and relieves his mind without producing any effect on the stolid French or German official. We advocate in railways, as in all other public works, progress; and history shows that more progress is to be obtained from every profit-paying concern in the hands of private individuals than of officials, whose natural interest is to avoid trouble for which they will not be paid, and responsibility for which they may severely suffer. The Post-Office and the telegraph are exceptions, for there the duties are simple, and many operations for public convenience must be carried on at a loss.

Circular to Gas Companies.

THE accounts of the metropolitan gas companies are presented annually to Parliament in a form prescribed by the Secretary of State, and the abstract of these accounts for 1870, published in our last issue, gives the key to the details by disclosing the amount paid for the coal carbonized by each company. It has been suggested to us, however, that an additional table, in which the details of the income, expenditure, profit, and capital are calculated out in relation to each ton of coal carbonized, might enable our provincial readers to make accurate comparison of their own working with that of their metropolitan brethren. Such a table will accordingly be found appended. It will be seen that the cost of coal per ton is calculated from the quantity actually used during the year, without reference to the quantity in stock at the commencement or in store at the close of the year. In making any comparison as to gas-rentals, it must be borne in mind that the Imperial is the only company that supplies a minimum of 14-candle gas at 3s. 9d., the Chartered supplying 16-candle gas at the same price, and 20-candle gas at 5s. 5d., while the Equitable supply the latter at 5s. 3d., and the London and Western at 5s. 6d. The Commercial and Surrey Consumers charge 4s. for 14-candle gas, the Independent 3s. 4d., and the South Metropolitan 3s. 2d. The Ratcliff charged 4s. 6d. for the first three months of the year, and 4s. for the last nine months, and have just announced a further reduction to 3s. 9d., to take effect at Christmas next. The Phœnix Company had a sliding scale of prices according to district, ranging from 3s. 9d. to 4s. 3d.

The diminution of revenue consequent on the supply of 16-candle gas is evidenced by the comparatively small gas-rental per ton of coals received by the Chartered Company, and the fact, we dare say, will be noted by the gas agitators with much satisfaction. The large gas-rental per ton of coal received by the Western Company is proof of the profitable nature of the manufacture of cannel gas, the gross profit per ton of coal realized by this company being considerably in excess of that made by any other of the metropolitan companies.

A noticeable fact revealed in the table we now give is the variable nature of the market for products, the best of which seems to be commanded by the London Company. The Western Company must, of course, be omitted in making any comparison under this head, owing to the low price obtained for cannel coke.

But little need be said about the cost of coals. The next return of the Chartered Company will, no doubt, exhibit the advantages derived from the Beckton works in diminishing the expenditure under this head. One thing which surprises us is the fact that coal cost the Surrey Consumers Company 11d. per ton more than the Phœnix Company, and 4d. per ton more than the South Metropolitan, both having lighterage to pay.

The small cost of purifying materials to the Chartered and Ratcliff Companies, and the high cost of purification to the Western Company, will strike some with astonishment; the latter is difficult to account for, even if lime alone is used.

The economy of labour in large works is well exhibited in the return of the Imperial Company. Next year's returns of the Chartered will, doubtless, show a considerable diminution under this head from the concentration at Beckton. Repairs occur at irregular intervals, and this will probably explain the high cost of these last year to the Imperial and Phœnix Companies. The low charge to the Chartered Company is probably due to no repairs having been made at the now abandoned Goswell Street and Curtain Road stations, and to their working with new apparatus at Beckton. On the other items there is not much to be said. The distribution expenses vary considerably, and this must necessarily be the case where the districts vary so much in extent. It is remarkable, however, to see the Ratcliff Company, with the smallest area of supply, standing nearly the highest in the cost of distribution.

On the whole, it must be said that the table we now give speaks exceedingly well for the management of the several companies.

In quoting the table we gave in our last "Circular," the *Journal d'Eclairage au Gaz* has made a blunder which deserves immediate correction. It has represented the profit on *gas-rental* as profit on *capital*. The assertion that a London gas company makes a profit of 45·71 per cent. on capital must greatly astonish a director of the Paris Gas Company, who must, however, see in a moment the error which has been committed.

In this place we may draw attention to the letter of a correspondent in another place, who seeks to depose the Phœnix from the head of the list, and put the South Metropolitan in its place. The reasoning of our correspondent, however, does not at all alter the fact that the Phœnix Company did last year make the highest profit on gas-rental.

The last half-yearly report of the Birmingham Gaslight and Coke Company, which we publish in another column, reveals

TABLE *showing the Income, Expenditure, Profit, and Capitals of the Metropolitan Gas Companies per Ton of Coal carbonized in the Year* 1870.

INCOME PER TON OF COAL CARBONIZED.

EXPENDITURE PER TON OF COAL CARBONIZED.

Name of Company.	Total Gas-Rental.	Meter-Rents.	Old Materials.	Products.	Miscellaneous	Total Income from all Sources.	Coals, including Carriage and Dues.	Purifying Materials.	Supervision and Labour in the Manufacture of Gas.	Ordinary Repair and maintenance of Premises, Tools, and other Implements.	Rents, Rates, and Taxes.	Salaries.	Collectors Commission.	Stationery, Printing, and General Charges.	Directors.	Auditors.	Expense of Distribution and Ordinary Repairs of Mains and Services.	Restoring and Replacing Meters.	Law and Parliamentary Charges.	Bad Debts, and Extraordinary Expenses.	Total Expenditure on Revenue Account.	Gross Profit per Ton of Coal carbonized.	Capital and Borrowed Moneys per Ton of Coal carbonized.
	£ s. d.	d.	d.	s. d.	d.	£ s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	d.	d.	d.	d.	d.	s. d.	d.	d.	d.	£ s. d.	s. d.	£ s. d.
CHARTERED . . . (partly cannel gas.)	1 12 8·36	3·36	1·29	6 5·60	1·32	1 19 7·93	17 11·71	0 2·95	4 5·09	1 11·00	1 0·45	4·03	4·58	2·84	4·63	0·25	1 8·64	8·50	1·44	6·53	1 10 0·64	9 7·29	8 0 6
COMMERCIAL . . .	1 13 6·24	None charged.	1·52	6 8·50	0·54	2 0 4·80	15 2·50	0 5·40	3 6·17	3 10·68	0 9·41	4·38	3·90	3·99	4·33	0·43	1 11·69	5·91	0·19	7·17	1 8 4·45	12 0·35	5 5 1
EQUITABLE . . . (partly cannel gas.)	1 15 8·66	8·00	0·99	7 11·83	4·10	2 4 9·58	17 2·88	0 3·92	3 5·11	2 6·63	1 2·85	6·17	5·19	6·87	7·23	0·43	1 9·42	2·19	0·30	4·57	1 9 3·26	15 6·32	6 0 5
IMPERIAL . . .	1 11 11·62	8·77	0·84	6 6·57	0·92	1 19 4·72	15 10·59	0 4·51	2 9·05	4 3·53	0 10·04	5·69	5·80	3·72	2·71	0·17	1 9·02	5·60	0·52	5·71	1 8 4·66	11 0·06	6 3 7
INDEPENDENT . . .	1 8 6·66	10·24	1·56	8 8·45	1·41	1 18 0·02	16 6·59	0 3·47	4 4·64	2 0·87	1 0·81	5·19	6·17	3·51	6·69	0·45	2 0·56	6·58	0·12	4·82	1 9 2·47	11 2·45	4 6 7
LONDON . . . (partly cannel gas.)	1 16 10·02	9·24	2·03	8 11·00	5·88	2 7 2·17	15 9·68	0 3·09	4 2·20	3 4·54	1 8·93	3·12	6·72	2·66	4·29	0·26	3 1·93	8·08	0·47	5·38	1 11 1·35	16 0·82	8 5 5
PHŒNIX	1 13 5·71	6·99	0·79	7 5·37	6·40	2 2 1·26	13 9·66	0 4·37	3 4·27	4 0·63	1 0·82	3·29	5·74	1·01	4·03	0·20	1 11·37	7·10	0·10	5·63	1 6 9·62	15 3·64	7 18 2
RATCLIFF	1 13 10·88	0·29	3·01	8 0·27	1·92	2 2 4·37	13 11·58	0 2·86	4 2·50	2 10·07	1 1·59	8·17	4·05	3·35	10·03	0·40	3 2·39	6·42	0·05	5·22	1 8 9·57	13 6·80	6 0 9
SOUTH METROPOLITAN	1 9 5·44	None charged.	1·31	7 11·48	5·82	1 18 0·05	14 4·03	0 4·02	4 4·20	1 9·15	1 0·40	4·85	4·87	5·14	4·66	0·39	3 8·72	6·12	0·30	7·19	1 8 4·04	9 8·01	4 17 1
SURREY CONSUMERS	1 10 3·29	0·03	0·32	6 11·77	1·22	1 17 4·63	14 8·26	0 3·94	3 1·62	1 1·69	1 2·71	5·45	3·53	4·06	7·40	0·34	1 10·60	6 38	2·96	3·36	1 5 2·30	12 2·33	6 0 8
WESTERN . . . . (cannel gas.)	2 7 8·18	1 1·67	0·32	4 1·84	0·07	2 13 0·08	22 8·76	1 0·96	4 2·03	1 0·37	0 9·53	7·45	5·94	5·04	6·03	0·48	2 11·88	4·11	0·48	4·75	1 15 7·81	17 5·27	6 16 8
AVERAGE . .	1 13 4·44	6·18	1·13	6 11·20	2·28	2 1 1·23	16 4·63	0 4·35	3 7·94	3 0·30	1 0·37	4·86	5·29	3·45	4·42	0·26	2 0·91	6·44	0·71	5·82	1 9 1·75	11 11·48	6 14 11

the extent of the frauds committed on the company by their late secretary and some of the collectors. The sum abstracted amounts to no less than £26,000, and the manner in which the abstraction was made was exactly that pursued by Higgs in the fraud on the Great Central Company. Sums which had been paid were carried forward quarter after quarter as arrears until the magnitude of the total attracted the attention of the auditors. There is really no means of effectually preventing the perpetration of frauds like this but a continuous audit by an accountant auditor, and this would be a great expense to a gas company. The officers of gas companies are exceedingly well paid, and defalcations of this kind are very rare. It behoves directors, however, to interpose every possible obstacle to the perpetration of fraud. In the case of the Birmingham Company, too much reliance appears to have been placed on a system of check, without a sufficient examination of details, in the absence of which no audit can be entirely satisfactory. The result to the company is the reduction of the reserve-fund, with accumulated interest, from £27,656 4s. to £350 15s 8d. The policy of the directors in thus immediately writing off the loss, in order to pay the maximum dividend, is open to question. However prosperous the business of a company may be, it is well to have some reserve to cover possible contingencies. Silly people see in these frauds a powerful argument in favour of the transference of gas-works to local municipalities, as if Corporation defaulters were entirely unknown. We believe that the accounts of gas companies are as effectively audited as those of Corporations; and as regards the profits of gas companies, they are, as all business men know, such as ordinary traders would laugh at.

By a vote of the Common Council of the City of London, the Special Gas Committee of the Corporation have been requested to visit the works of Dr. Eveleigh, at Peckham, and to report to the court whether, in their opinion, the process is calculated to supply the public with gas of a superior quality at a lower cost than at present. The process of Dr. Eveleigh, so far as it can be gathered from his patents, has been more than once described in our JOURNAL; but as it is now attracting considerable attention, we may mention it again. The first patent is dated Jan. 7, 1869; some improvements have been patented since, but the specification of these has not yet been printed. The patent of 1869 includes a process for the purification of mineral oils, and the application of gas to heating purposes; but so far as it relates to the manufacture of gas the process may be described very shortly. Coal is first distilled in an ordinary retort, and the gas produced is made to pass through a series of what are called "redistillation "retorts." These are cylindrical vessels set vertically in a furnace, and so connected that the gas passes from one to the other through the series. They are packed the greater part of their height with charcoal and lime in small lumps, and at the top of each is a layer one or two inches thick of iron filings or turnings. The first of the series is in connexion with a reservoir of creosote, oil, or petroleum, and, according to the specification, when the flow of gas from the retorts in which coal is being distilled slackens, and the redistillation retorts become sufficiently heated, the liquid substance in the reservoir, tar, creosote, petroleum, or whatever it may be, is allowed to flow slowly into the first redistillation retort. No doubt, as stated in the specification, "the oil or other "liquid is soon vaporized in the redistillation retorts;" but we must leave our readers to form their own conclusions as to the probable truth of the following explanation of other changes said to take place:—"Bicarburetted hydrogen and carburetted hydrogen "are separated from the gas and vapours passing over from the "retorts, and produced from the oil. The other parts, such as "ammonia, carbonic acid, pitch vapour, water, creosote, naphtha-"line, and the like, are decomposed by the 'chemical purifiers' "(*i.e.*, lime charcoal and iron filings) in the redistillation retorts, "the result being the production of more bicarburetted and car-"buretted hydrogen, carbonic oxide, cyanogen, and free hydrogen, "which pass forward, together forming a good available lighting "gas." To our mind this looks more like a carburation process than anything else, for we have great doubt about the breaking up of heavy hydrocarbons into permanent gases, except under circumstances very different to those which can obtain in these redistlilation retorts. It will be remembered that many years ago Mr. Basford passed raw gas through a second retort filled with coke or charcoal, with the idea of breaking up tar into permanent gas; but the only result was the production of a large quantity of naphthaline, which soon deposited, and left a comparatively poor gas.

We publish with pleasure a letter by Mr. George Livesey, on the "Sunday Labour Question." The object Mr. Livesey has in view deserves the heartiest support of all gas manufacturers, and we hope the plan he and others have devised for giving their men a Sabbath-day's rest will soon be generally adopted. There is no objection to leaving the retorts with their lids on if the heats be well kept up; but, as we have said before, the question is more one of storeage room than anything else.

The prize essay "On the Removal of Impurities from Coal Gas," by Mr. Innes, of Forfar, read at the meeting of the North British Association of Gas Managers, and published in our last, deserves some words of commendation. It evinces a very complete acquaintance with the chemistry of the subject, and if the author has not altogether succeeded in expressing himself in a way which would be understood by all gas managers, it is evidently from no lack of knowledge. It is difficult to treat of chemical matters in a manner perfectly intelligible to those who have only a small acquaintance with the science; but the essay, on the whole, reflects the greatest credit on the author.

Our subscribers will receive with this issue of the JOURNAL the first of four additional plates of the Beckton works, promised some months ago. This plate, which gives the details of the retort-settings, is numbered 3 *B*, and in the collected series of drawings follows the elevation of retort-house. The remaining drawings will be given as opportunity occurs during the present year.

Correspondence.

THE METROPOLIS GAS ACCOUNTS.

SIR,—In your analysis of the accounts of the several London gas companies you say "the Phœnix Company keeps the lead in making the highest profits on gas-rental." From the figures in the returns to the Board of Trade I admit you are correct, but I think you should have qualified your statement by pointing out that such an enviable (?) position had been obtained by charging a higher price.

The price charged by the Phœnix Company is 25 per cent. higher than that of the South Metropolitan Company, for gas less in quality by 10 to 12 per cent.; this enables them to show a profit on rental of 45·71 per cent., against 32·82 per cent. of the South Metropolitan; but if the gas of the Phœnix had been at the same price as the South Metropolitan, their rental would have been less by at least £33,400, and consequently the profit would be lessened to that extent, and as the South Metropolitan does not charge for use of meters, the item of £3471 received under that head by the Phœnix Company must be added to the £33,400, making together a reduction in the amount of profit of £36,871. On the other hand, as the South Metropolitan account is debited with sundry charges not paid by the Phœnix Company, such as Board of Trade expenses, workmen's sick and superannuation funds, summer holidays, &c., the balance of profit, for the purpose of a fair comparison, must be raised to the extent of these several items; then the Phœnix profit on capital will be very little better than half that of the South Metropolitan, and on rental the Phœnix profits will be reduced from 45·71 to 33 per cent., and the South Metropolitan will be increased from 32·82 to 37·14 per cent., thus showing that the South Metropolitan takes "the lead" from the Phœnix; and I have no doubt that, while they are allowed to "stand alone," the South Metropolitan will be able to maintain their high position, and

KEEP THE LEAD.

SUNDAY LABOUR IN GAS-WORKS.

SIR,—Before the winter comes I wish, with your permission, to draw the attention of gas managers again to the question of Sunday labour.

It is not only possible to cease making gas for twelve hours on Sunday, but it is a very satisfactory measure to both masters and men.

The only thing wanted is to work a few more retorts during the week, so that the make each day is a trifle greater than the consumption; there is then a full stock of gas on Saturday, and a surplus left for Sunday.

I contend that this is the right principle, and, on the other hand, that it is utterly wrong, looked at from all points, to make rather less gas during the six days than is used, making good the deficiency by working full time and retorts on Sunday.

The plan adopted by myself, and, I believe, Mr. Morton, of the London, Mr. Woodall, of the Phœnix, Mr. Cathels, of the Crystal Palace District, Mr. Eldridge, of Richmond, and some other companies, is to leave the charges in the retorts, with the lids on, during the whole day of Sunday; the gas made after about half-past nine being allowed to escape from the hydraulic main by taking out a 2-inch plug, the exhauster being stopped at say nine o'clock.

The day stokers are thus entirely relieved from work. They leave work on Saturday evening at six o'clock, and return on Sunday at the same time; while the night men, who left at six on Sunday morning, return at six on Monday morning, every man thus having 24 hours off work weekly. The change from day to night work is, of course, made weekly also. The heats are kept up at this time by about eight odd men, slow-firing with rough breeze, the dampers on the top of the short chimneys being quite closed.

No pay is given to the stokers relieved from duty; thus one gang gets six days pay, and the other seven days in the week.

It has often been said that if the men have the Sunday they will make a bad use of it. I do not think so; but whether they do or not, they have a Divine right to a day of rest, and if I withhold it, when there is *no necessity* to do so, the responsibility rests on my head.

I venture to ask you to insert this, because I believe the movement to be one for the interest of both the companies and their men, and you have always shown a willingness to forward those interests.

South Metropolitan Gas-Works, GEORGE LIVESEY.
Sept. 21, 1871.

Parliamentary Intelligence.

HOUSE OF LORDS.

(Before Lord WHARNCLIFFE, *Chairman; the Earl of* MORTON, *Lord* ELIOT, *Lord* NORTHWICH, *and Lord* CHURSTON.)

EDINBURGH AND DISTRICT WATER BILL.

JUNE 28 TO JULY 7.

Mr. CALVERT, Q.C., Mr. DENISON, Q.C., Mr. POPE, Q.C., and Mr. CLERK, Q.C., appeared for the promoters, the Edinburgh and District Water Trustees; Mr. RODWELL, Q.C., Mr. SHIRESS WILL, and Mr. J. H. A. MACDONALD, on the petition of ratepayers and others in Edinburgh. Mr. MUNDELL appeared on the petition of the Duke of Buccleuch, Mr. SHIRESS WILL also appeared on the petition of the Corporation and Police Commissioners of Selkirk, opposing the bill.

Mr. CALVERT, in opening the case, narrated at some length the circumstances under which the bill came before their lordships. With regard to the petitioners, he argued that the Duke of Buccleuch not having appeared against the preamble of the bill in the House of Commons could only be heard upon clauses here; and with regard to the other opponents, he hoped their lordships would come to the conclusion that, as they objected to the source of supply proposed by the bill, they ought to select some one source, and offer it as the best, in order that it might be compared with that which was now submitted.

Lord CHURSTON: We cannot come to a resolution that they shall not be heard upon those alternative sources which they suggest.

The CHAIRMAN said as the Duke of Buccleuch did not appear on any of the clauses in the House of Commons, nor propose any amendment, this committee could not shut him out now.

Evidence in support of the bill was then called, and the following witnesses, who appeared before the committee of the House of Commons, were examined:—Mr. D. Lewis; W. Law, Esq., Provost of Edinburgh; J. Watt, Esq., Provost of Leith; T. Wood, Esq., Provost of Portobello; Mr. A. Archibald, Dr. Frankland, Dr. A. Wood, Dr. H. D. Littlejohn, Dr. Stevenson Macadam, Mr. W. H. Cameron, Mr. R. Paterson, Mr. J. S. Stewart, J. F. Bateman, Esq., J. Hawkshaw, Esq., and Mr. A. Thompson.

Mr. *Carnent*, solicitor, of Edinburgh, and Mr. *W. Paterson*, secretary of the Edinburgh Associated Carpenters, were called to prove the necessity for an improved water supply to the city.

The CHAIRMAN then intimated that the committee were of opinion sufficient evidence had been given as to the want of water in Edinburgh, leaving open the question of the superiority of the St. Mary's Loch source over any other.

Mr. RODWELL said he admitted that until something was done for Edinburgh with regard to its water supply, the present supply, either from mismanagement or from other causes, was insufficient. He adhered to what he had previously stated—viz., that gross mismanagement had led to this result, but there were ample means of supplying Edinburgh without going to the enormous expense which the St. Mary's Loch scheme would involve. He wanted to keep open the question of waste, and his case was that with proper management and economy, both at the reservoir and in the distribution apparatus, in Edinburgh, there would not be the want of water described by witnesses.

The CHAIRMAN suggested that if the counsel on either side would confine the question to waste, it might shorten the case.

Mr. *P. M'Neill*, manager of the Joiners Building Company; Mr. *J. C. Burn*, blacksmith, and Mr. *R. Haume*, plumber, were thereupon called to prove that the fittings generally were in good order, and not calculated to create waste.

The following new evidence was then given:—

Dr. *James Struthers*, examined by Mr. CLERK.

I am an M.D. of the University of Edinburgh, and practise at Leith, where the want of water is severely felt in our public institutions. I have visited the various water districts in question. In St. Mary's Loch I had to lift some six or seven tumblers of water before I found a single flea, whereas in the Clubbiedean reservoir, which is pure spring water, I found fleas in every tumbler. From my own cistern I have taken fifteen fleas in one cupful of water. The water flowing out of the loch was clearer than when it flowed in from its feeding streams—the Megget and Yarrow. I dredged a part of the loch at a depth of 19 to 20 feet at some distance from the shore, and brought up nothing but pure silt. I dredged the mouth of the Megget, and found the same sandy material, mixed with bits of fern stalks and leaves. Almost the same class of weeds are found at the bottom of any loch where there is vegetable growth, and in reservoirs, whether natural or artificial.

Cross-examined by Mr. MACDONALD: Clubbiedean, Torduff, and Glencorse are the reservoirs from which Edinburgh is supplied. They are not peaty.

Mr. *T. C. Archer*, examined by Mr. CALVERT.

I am director of the Edinburgh Museum. I dredged the loch near Roderic. I found no peat, but an exceedingly fine mud. The wind was blowing very strongly at the time. I am satisfied that nothing would arise from the bottom of the loch to render the water unfit for use. I also visited the Pentland reservoirs and found that Logarlee was distinctly tinted on the stone slope of the embankment. There was a brown deposit on the stones and piles which was unquestionably vegetable matter. I also dredged Glencorse, and found an extremely tenacious and slimy reddish mud. At Clubbiedean I found the bottom covered with vegetation of a brownish-green colour, and in a growing state. The bottom of Torduff I found was composed of comparatively rotten vegetable matter. It appeared to be bent grass.

Mr. *Robert Adam*, examined by Mr. CLERK.

I am accountant to the corporation. I estimate if the revenue goes on as it has done for many years past there will, at the expiration of the sixth year, be a surplus of £13,965, a portion of which would be applicable to a sinking-fund. The Edinburgh rates compare favourably with those of other Scotch towns. It is about the least heavily taxed of the seven large towns in Scotland.

Mr. RODWELL: Therefore, because Edinburgh is lightly taxed, you think that it can bear a heavy water-rate?

Witness: I certainly think that it is better able to do so than a town more heavily taxed.

Mr. RODWELL: Have you calculated the interest on the capital which will, so to speak, lie dormant for the next 10 or 15 years—that is, before the necessity will arise for the use of all that extra water, and the capital employed in the construction of these works?

Witness: I have had no figures upon which to found a calculation.

Re-examined by Mr. CLERK: It must be the case, in all undertakings where works are made beyond the present requirements, that the interest of the outlay must be met before the supply is obtained.

Mr. *William Watson*, examined by Mr. POPE.

I am the city chamberlain of Glasgow. When the Loch Katrine scheme was before Parliament there was the same apprehension as to increased rates that exists in the present case; the result, however, has been a decrease from 14d. in the pound to 8d.

Cross-examined by Mr. RODWELL: The parliamentary estimate for the Glasgow works was £575,000, and the ultimate cost was upwards of £900,000; the parliamentary estimate was increased, however.

Dr. *Wm. Odling*, examined by Mr. CLERK.

I agree with the evidence given by Dr. Frankland as to the suitability of soft lake water for town supply, and that soft water does not act upon lead. I have analyzed the water of St. Mary's Loch, and found that although, like the great majority of lake waters, it is not absolutely devoid of colour, yet it would be ordinarily called a colourless water. I found no fleas, but you cannot have large masses of wholesome water without large and small animals being generated. The animals in question are not fleas; they are, in fact, small fresh-water shrimps, and I believe it is because of their rapid movement that they have been called fleas.

Cross-examined by Mr. RODWELL: I would not stake my reputation upon the three samples alone that were sent me, that the loch water was a good one at all seasons of the year.

Re-examined by Mr. CLERK: The streams that feed the loch must be at times more peaty than at others, but when they are impounded in the large collecting-ground the actual difference is very small.

Mr. *David Brown*, examined by Mr. CALVERT.

I have been an officer of the water company for many years. We have never had a constant service since the Glencorse came in. I accompanied Mr. Ayres, of Norwich, to inspect the apparatus in places where there were defects. There is much less waste now than formerly, as the trustees employ three men regularly to inspect the houses. There will, however, in spite of this trouble, still be waste.

Cross-examined by Mr. RODWELL: The great waste was owing to the bad repairs of the fittings of the water-closets and the kitchen cisterns, from the overflow from the cisterns, and the ball-cocks not acting. These things are being remedied.

Re-examined by Mr. CALVERT: Where there is a constant supply people do not leave their taps open. As the matter now stands, a person turns the cock not knowing whether it is turned off or not, and may go to bed and rise again and find the water running all over the place.

Mr. CALVERT stated that this was the case for the bill.

On behalf of the opponents, the following witnesses, who were examined before the committee of the House of Commons, were called:—Mr. B. Miller, J. Glaisher, Esq., Mr. A. Ramsay, Mr. T. Field, Mr. R. Wilson, Dr. Letheby, Professor Geikie, C. Cowan, Esq., Dr. Pole, J. R. Forman, Esq., and T. Hawksley, Esq.

The following additional evidence was also given:—

Mr. *Colin Mackenzie*, examined by Mr. RODWELL.

I am a writer to the signet at Edinburgh, and am deputy-keeper of the Great Seal of Scotland. I am in no way professionally concerned in these proceedings. I have no recollection of any question which has caused so much difference of opinion, or so much opposition, as this bill among all classes of the population. A great many of the working classes are opposed to it. With regard to prejudice against the bill, the question of fleas has been treated more as a joke than anything else. I believe the main objections to the scheme are the quality of the water and the cost. Public meetings have been held in opposition to the bill. The St. Mary's Loch scheme involves a much larger present expenditure than any of the other schemes, and therefore I think it would be cheaper to take a more moderate scheme at present, and to come to Parliament for a second expenditure when it is required, than to lay out a much larger sum at present, and to lose the accruing interest upon the difference during 20 years. Any deficiency will have to be made up by a domestic water-rate. It is a cruel rate on the very poorest of the population. Instead of putting their assessment according to rental throughout, when they come to houses rented at £5 and under, they put on an impost of 5s. There are many houses rented at £2 and £2 10s., and that practically amounts to a rate of 2s. in the pound. I believe the cost of the scheme will be nearer £750,000 than £500,000. Assuming they come back to Parliament and obtain additional borrowing powers, that would involve a rate, according to my calculation, of about 1s. 8d. in the pound, beside the public rate. It is a question whether they will succeed in borrowing so large a sum at 4 per cent. I do not see any reason why Edinburgh requires the proposed extravagant supply. Glasgow is a manufacturing town, and Edinburgh is not; therefore I cannot see any analogy between the two. I think the increase of the population of late years is exceptional. In my opinion, Edinburgh has been overbuilt, and I expect to see a fall in almost all house property. I estimate the difference, in favour of the ratepayers, at the end of 20 years, by adopting the Moorfoot and Heriot schemes now, would be rather more than £250,000. I have taken Mr. Bateman's figures.

Cross-examined by Mr. DENISON: I am aware Mr. Leslie is averse to the Pentlands scheme, and that Mr. Hawksley has set it up. Some people may not regard the fleas as a joke. I think it is desirable that water should run into the drains, but I do not see why the dirty should not go in, instead of the clean. Leith is a manufacturing place. The increase in population in Edinburgh, Leith, and Portobello has, I think, been 40,000 during the past ten years.

Re-examined by Mr. RODWELL: If Mr. Leslie's report had been published, the public would have had further information, upon which they might have acted. I agree with Dr. Frankland, that it is desirable to introduce a water to which there is no antipathy on the part of the public.

Mr. *Daniel Robertson*, examined by Mr. MACDONALD.

I am convener of the incorporated trades of Edinburgh, and a member of the Town Council. When I became a Water Trustee in November, 1870, I believe the other trustees had made up their minds to proceed with the St. Mary Loch scheme. Some weeks after a report was issued, signed by Bailie Lewis, referring to reports and estimates by Messrs. Stewart, Bateman, and Leslie. I was anxious to see Mr. Lewis's report, and my request was only granted on the condition that I should not make known anything contained therein. I declined the condition, as I considered the ratepayers ought to be made acquainted with the report.

Mr. *Wm. Macdonald*, examined by Mr. MACDONALD.

I am a writer of Edinburgh. I practice by favour in the small debts courts. There are cases almost every week of actions for damages raised against landlords for defective pipes, which cause injury to the houses by waste of water.

Mr. *M'Whinnie*, secretary to the Tailors Society of Edinburgh, and Mr. *A. M'Clelland*, first lieutenant of police at Edinburgh, were examined as to the feeling of the working classes against the bill, and the number of persons attending the meeting at the Queen's Park on the 17th of June, in favour of the bill.

Mr. *James Cree*, examined by Mr. RODWELL.

I am a wine merchant of Leith. The largest manufacturers do not use the corporation water, but sink their own wells. I am a partner in a sugar refinery which uses 50,000 gallons of well water weekly. As the sale of water to the manufacturers falls off, there is a greater demand upon the rates. My own class of people are decidedly opposed to the bill. The large engineers are supplied from the waters of Leith. Sewage water is preferable for manufactories. I think the majority of working men both in Edinburgh and Leith are decidedly opposed to this measure.

Cross-examined by Mr. CALVERT: There is a scarcity of water for domestic purposes, but no scarcity as regards the existing manufacturers. The water of Leith is not fit for drinking purposes. Last year our firm asked the corporation to pump the water at Loch-End for them, because we get it cheaper than from any other source.

Mr. *J. J. Lundy*, town councillor of Leith, was examined by Mr. Macdonald and corroborated the evidence of the former witness.

Dr. *R. Christison*, examined by Mr. RODWELL.

I am president of the Royal Society of Edinburgh, and professor of *materia medica* in the university. On the 12th and 13th of June last, I was at St. Mary's Loch. For six weeks previously there had not been sufficient rain to increase the body of the water in the streams. The water was of an amber-yellow colour, and is much darker than the water at present supplied to Edinburgh. It appeared to have the flattish taste of lake water. I could not

make up my mind as to whether it tasted peaty. I detected water fleas in the loch. I also saw minute fleecy particles of dead organic matter. I plummed the bottom, and the plummet semed to descend on minute peaty matter or mud. The temperature at the bottom of the water was 45 and 46, and at the surface it was 56 and 57. I analyzed the water, and found extract of peat, and a small proportion of salts, as is usually contained in our lowland waters. There are peat haggs in the neighbourhood of the loch. Although the water could be deprived of its colour on a small scale by chemical means, yet I am not acquainted with any mode by which you could destroy that colour on a large scale. In the course of the descent of a stream, a process of oxidation takes place, by which the organic matter is lost. If such a process of discoloration could be adopted, I should have no objection to the water. Mechanical filtration will not remove the organic impurities which give colour to the water. Peaty waters in general have a tendency to cause affection of the bowels. I should not like to recommend the St. Mary's Loch water without further information.

Dr. *Jabez Hogg*, examined by Mr. RODWELL.

I am surgeon to the Royal Westminster Ophthalmic Hospital, and honorary secretary of the Royal Microscopical Society. I analyzed the water sent me from St. Mary's Loch in June. In the first sample I found an immense quantity of vegetable matter composed chiefly of confervæ, navicula, and diatomaceæ, and animal matter composed of amœba diffluens, cercomonas, and larval forms of trichoda, lycenus, and an immense amount of decaying vegetable organic matter with fragments of entomostraca and scales of moths. The second sample was rather better, and contained less organic matter. The sample taken from the loch at Bowerhope smelt badly. The stones I discovered to be covered some quarter of an inch by vegetable and organic remains. I tested the water with permanganate of potash, which turned it brown, while it leaves the Edinburgh water bright and clear. I infer that the St. Mary's Loch water is very unwholesome, and during the summer diarrhœa and dysentery, and many of our gastric fevers, originate from drinking water of that kind. This organic matter is held in solution and suspension, and therefore filtration does not affect it. The water contains the cyclops or water flea, and an immense quantity of their ova and larvæ, which are so minute as to defy any process of mechanical filtration that I have found. There is also a strong infusion of peat in the water. There is horribly filthy mud at the bottom of the loch, full of organic matter. I examined the waters of the Pentland reservoirs, and found them of a tolerably good quality. They contained a small amount of vegetable matter, and only a few spores or ova of animals. That from the Fleetwood Burn was rather dirty, but I believe it was taken during the rainy weather. That from the Megget below the bridge was rather a bad specimen. The water of the lower loch was very good. The Edinburgh and Heriot waters are both good.

Cross-examined by Mr. DENISON: The London water in 1852 was as bad as the water in question. It has since been filtered and the reservoirs covered in, and it has made a great deal of difference. I consider Dr. Frankland unfair in disregarding the organic matter in water. Dr. Odling supports Dr. Frankland's view to a moderate extent. My method of testing the water is inferior to a complete analysis. I have not analyzed the Loch Katrine water.

Re-examined by Mr. RODWELL: I conducted my experiments independently of any evidence given elsewhere.

Dr. *A. Voelcker* was examined by Mr. MACDONALD, and stated that he agreed with Dr. Letheby's analysis and evidence generally.

Mr. *Dewar*, examined by Mr. RODWELL.

I am a Fellow of the Royal Society of Edinburgh, and professor of chemistry in the Veterinary College. I have analyzed the St. Mary's Loch water, and find that it contains five times as much organic matter as the present supply. I produce a sample of water from a depth of 150 feet which contains minute organization. From an experiment I made, I infer that if the upper stratum of water is in the same place and condition as it was during the winter months, that there is no aëration taking place in this loch, consequently the water must be very badly aërated below. There is no active current that is perfectly distinct. On the 1st of July last I visited the Swanston and Coniston springs, within two miles of Edinburgh. I observed, at the latter place, two waste-pipes, one running as hard as it could, and the other about half. This was water that might have gone into Edinburgh.

Cross-examined by Mr. DENISON: The Coniston water is spring water. I disagree with Dr. Frankland, who says it contains the washings of highly manured fields.

Mr. *Wm. Mitchell*, examined by Mr. MACDONALD.

I am a farmer on the banks of the Megget. The general character of the country about St. Mary's Loch is pasturable. The flat hill tops consist mostly of moss, and it is from these that the principal streams are supplied to the loch. The Megget rises from Moss. It is very dark after a flood. The water runs over a meadow in time of flood, and when it subsides we find a great deal of refuse mixed with peaty matter. I have seen the deposit in places lying a foot thick, and I successfully use it as manure. Sheep are washed in the different burns round the loch. Before washing, they are dipped in a composition to destroy the fleas. I do not think any one drinks the water, except at Tibbyshiels.

Cross-examined by Mr. CLERK: My farm is nearly a mile from the loch, and the Henderland Burn runs near my door. I never use peat as a top-dressing for my land. The refuse from the loch which I use is an earthy alluvial soil.

Mr. *John Ayris*, examined by Mr. WILL.

We were supplying 40 gallons a head at Norwich in 1858, and we were obliged to shut off the water at night, in defiance of the Act of Parliament, as we could not pump a sufficient quantity. We came to Parliament and obtained power to control our fittings, and within three years afterwards we brought the supply down to 14½ gallons per head without complaint. We have constant service night and day. We only calculate the persons positively supplied, not the entire population. When the supply was 40 gallons a head we received complaints of want of water, as the water would not rise to the cisterns; the water-closets on the lower levels getting out of repair kept the water from rising to the upper levels. I found the same class of complaint arising in Edinburgh when I visited there in 1868. I found the fittings there exceedingly bad, and the waste was very great. Twenty-five gallons per head would be an amply supply, including 4 gallons a head per day for water-closet consumption. The trustees might alter the closets at 50s. each, which would cost about £32,000, and thereby limit the waste arising therefrom. I believe that would be an economical arrangement; but whether they have an increased supply or not, further expense must be gone to, as larger pipes are required, and the pipes should be more frequently connected with the company's mains. For the last two years the private wells of Norwich have been dry. I have put a meter to 28 cottages, containing 120 people, each cottage having a separate water-closet, and in 950 days I found the average consumption was 8 gallons per head for everything. In my own house, where we have a water-closet, bath, and stable, we use 10·87 gallons per head.

Cross-examined by Mr. CLERK: I know nothing about what has been done to remedy waste in Edinburgh since 1868. At that time the right to introduce screw-taps had not been obtained.

Mr. *Alfred Morant*, engineer to the Norwich Board of Health, was next examined by Mr. RODWELL, and corroborated the evidence of the last witness.

Mr. *G. W. Hemans*, examined by Mr. MACDONALD.

I am a civil engineer of 25 years experience. I have had special experience in tunnelling. I examined the Pentland Hills in company with Mr. Ramsay and Mr. Forman. Assuming that water escapes over the waste weir in Glencorse in wet years, there are easy means in that valley of storing a large quantity of that escaped water. For £60,000 enough could be stored to carry them over a dry year. There are nine good sites for reservoirs in the Pentlands. I concur in the statement that an excellent one could be made in the South Esk to afford 9 million gallons a day for Edinburgh. The Musselburgh and Dalkeith supply would not interfere with this estimate. I have visited the St. Mary's Loch district. From experience in other places I feel confident that the proposed tunnels, which are to be cut through vertical strata, will contain in all the works, and especially the shafts, which must be very numerous, a great deal of water. If these shafts are made in the same proportion as those in the Loch Katrine tunnel, they will be about 200 yards apart. The first tunnel will require 28 of these, at an average depth of 210 feet. I believe these shafts cannot be executed under £20 a yard down, and that the tunnel itself cannot be executed under £10 a yard, exclusive of shafts; £16 5s. is the minimum price for the tunnelling, including the necessary shafts. This makes an excess on the estimate of the promoters of over £50,000. In my estimate, I assumed that it was intended to arch over the aqueduct. I hear lately that it is not intended to do so. I think it is a very bad thing not to arch it over, because running from the loch 3½ miles in an open tunnel, part of which is 50 feet deep, will entail a great deal of running down of water in heavy rains into the bottom, which is 10 feet wide. My estimate is £694,000. Upon comparing these works with the only two analogous works in the kingdom (the Glasgow, and the Dublin works), and putting the expense at the same rate per mile, the St. Mary's Loch scheme would cost £822,000 at the Loch Katrine prices, and £666,000 at the Dublin prices. The St. Mary's Loch water astonished me by its dirty condition and bad taste.

Cross-examined by Mr. DENISON: I am aware the Loch Katrine tunnel is not through the same kind of rock as this scheme, and the printed report states that they were very little troubled with water. The Loch Katrine rock is mica schist.

By the COMMITTEE: It has been stated that the Edinburgh Company had rights to at least 4 million gallons, which they did not store.

Mr. RODWELL then addressed the committee on behalf of the ratepayers of Edinburgh at great length, and Mr. DENISON was heard in reply, after which the room was cleared, and when the committee had deliberated for about twenty minutes the parties we readmitted, and

The CHAIRMAN said: This case, being a very important one apparently, the committee think it right to put in writing their opinion, and the reasons for coming to it. The committee are of opinion that it is not expedient to proceed further with the bill. They hold that, with better care and regulation as regards waste, and with increased storeage for the utilization of the water drawn from the present sources of supply, Edinburgh can obtain all that is requisite for its needs; and they hold further, that they cannot sanction so large an expenditure of money, which appears not to be required at present.

Mr. Serjeant SARGOOD applied for costs on behalf of the Messrs. Brown, but the application was refused.

Legal Intelligence.

IMPORTANT JUDGEMENT AS TO THE MEANING OF THE WORDS "ANNUAL VALUE."

LOWESTOFT COUNTY COURT.—FRIDAY, AUG. 25.

(*Before* — WORLLEDGE, *Esq.*, *Judge*.)

THE LOWESTOFT GAS AND WATER COMPANY *v.* BEAN.

In this case, which had been argued on a previous day, the learned judge now delivered judgment.

His HONOUR said: This was an action brought to recover from the defendant the sum of £1 16s. 6d. for water supplied by the company to the defendant. Mr. Chamberlin appeared for the plaintiffs, and Mr. Howard Taylor for the defendant, and I feel it due to both gentlemen to say that in my opinion the case was very ably argued on both sides. The plaintiff company was incorporated by the Lowestoft Water, Gas, and Market Act, 1853, and the Companies Clauses Consolidation Act, 1845. The Lands Clauses Consolidation Act, 1845, and the Water-Works Clauses Act, 1847, are incorporated in the local Act. The 32nd section of the local Act provides that "The company may demand and take the following rates, according to the yearly value of each dwelling-house, or part of a dwelling-house. If there be no water-closet or bath in the dwelling-house to be supplied with water, then at the following rates:—When the annual value of such house shall not amount to £5, at a rate not exceeding 4s. 6d. per annum. When the annual value of such dwelling-house shall be £5 and under £50, at a rate per cent. not exceeding £6. When the annual value of such dwelling-house shall be £50 and under £100, at a rate per cent. per annum not exceeding £5 10s. When the annual value of such dwelling-house shall be £100 and upwards, at a rate per cent. per annum not exceeding £5." And then follow provisions with reference to water-closets and baths, about which there is no dispute. The defendant is the owner and occupier of two houses in Lowestoft, which he lets out as lodgings during the season—one, No. 5, Esplanade; the other No. 19, Marine Parade; and Mr. Bean is charged for the water supplied to No. 5, Esplanade, on an assumed annual value of £60, and for that supplied to No. 19, Marine Parade, upon an assumed value of £40, and each house contains two water-closets.

Therefore, the sum claimed for No. 5, Esplanade, annually is 5½ per cent. on £60—£3 6s.; and for two water-closets, 17s. .	£4	3	0
And the annual sum claimed for No. 19, Marine Parade, is 6 per cent. on £40—£2 8s.; and for two water-closets, 15s. . . .	3	3	0
And the sum claimed in the action is for the quarter's supply, from Dec. 25, 1870, to March 25, 1871:			
On house No. 5, Esplanade	1	0	9
On house No. 19, Marine Parade	0	15	9
	£1	16	6

Mr. Taylor made certain preliminary objections to the plaintiffs right to recover before he came to the real question in the cause, which is as to the meaning of the words "annual value" in the 32nd section of the local Act above in part set out, and I will dispose of these preliminary objections first. First, then, Mr. Taylor objected that this court had no jurisdiction to try this case, and he referred to section 68 of the Water-Works Clauses Act, 1847, which is as follows:—"The water-rates, except as hereinafter and in the special Act mentioned, shall be paid by and recoverable from the person requiring, receiving, or using the supply of water, and shall be payable according to the annual value of the tenement supplied with water; and if any dispute arise as to such value, the same shall be determined by two justices." And Mr. Taylor argued that, as in the present case the real dispute is as to the annual value of defendant's two houses, two justices alone had jurisdiction to try the case and determine such dispute. Mr. Chamberlin, on the other side, referred to section 59 of the local Act, which provides "That the local Act, or anything therein contained, shall not prevent the company from recovering any money, not exceeding £50, due to them for any rates, tolls, rents, damages, costs, or expenses, by proceeding in any court of competent jurisdiction;" and he contended that the section just quoted overrode every provision in the local Act, and in the Acts incorporated therewith, and so gave this court jurisdiction. Mr. Taylor answered that the 59th section of the local Act would be satisfied by the construction; that under section 68 of the general Act, two justices should determine the annual

value; and that then an action might be brought to recover the rate made upon the annual value as fixed by the justices. But that construction would render two proceedings necessary instead of one—viz., first a proceeding before the justices to fix the value, and then an action to recover the rate, which would be a very inconvenient construction, to say the least of it; and it may be further observed that the dispute in the present case is not as to what the annual money value of the defendant's two houses really is, but as to the meaning to be put on the words "annual value" in the 32nd section of the local Act, and in the 68th section of the general Act. I therefore retain the opinion I expressed at the trial, that this court has jurisdiction. Mr. Taylor next objected that it is the duty of the company to make a formal rate, like a poor-rate or a highway-rate, under their common seal; and that ,not having done so, they cannot recover their rates by action or other proceeding. But I think it is clear that, when the Legislature require formal rates to be made, they say so, as in the Poor-Law Acts—*e.g.*, 6 and 7 William IV., c. 96, sect. 2, and in the schedule to that Act the form of the rate is given; and in like manner in the Highway Act, 5 and 6 William IV., c. 50, sect. 27, the surveyors of highways were required to make a rate, and the form of rate is given in the schedule No. 4. But neither the local Act in this case, nor the Water-Works Clauses Act, 1847, anywhere require a water-rate to be made. The provisions of the general Act, as to the "water-rates," extend from section 68 to section 74, both inclusive, and not a word appears with reference to the making of a formal "water-rate;" and if it was intended impliedly that a "formal rate" should be made, one would have expected to find some provisions in the general Act authorizing an appeal against the rate. And as Mr. Chamberlin very truly showed that, if it was necessary to make a rate, parties to whose premises water might be laid on between the making of one rate and the making of the next would escape payment for the water they might consume during the interval before the next rate was made. I am of opinion, therefore, that, as neither the local Act nor the Water-Works Clauses Act, 1847, in terms require a formal rate to be made, it is unnecessary to make one, and Mr. Taylor's second objection fails. It was further proved for the defence that no water at all was consumed in the house No. 19, Marine Parade, during the quarter from December 25, 1870, to March 25, 1871; and therefore Mr. Taylor urged that, as to that house at all events, defendant ought not to be made to pay. But the short answer to this objection is, that the defendant gave no notice of his intention to discontinue the use of the water, as required by section 71 of the Water-Works Clauses Act, 1847, and therefore his non-user of water during the quarter is no answer to the action. Having now disposed of the above objections, I will proceed to the consideration of the real question in the cause, and that is, as to the meaning of the words "annual value" in the 32nd section of the local Act, and section 68 of the Water-Works Clauses Act, 1847. Mr. Chamberlin contended the annual value of a house means what it would let for, and he proved by a great body of evidence, given by gentlemen well acquainted with the value of house property in Lowestoft, that No. 5, Esplanade, would readily let for £60, and No. 19, Marine Parade, for £40 per annum, and I am perfectly satisfied that they would let at those rents respectively. Mr. Taylor, on the other hand, proved that, in the valuation list now in force for the parish of Lowestoft, No. 5, Esplanade, is set down at a gross rental of £55, and the rateable value £46 10s.; and No. 19, Marine Parade, at a gross estimated rental of £35, and the rateable value £28; and he contended that the union assessment valuation list was conclusive evidence of the annual value of the properties comprised therein for the purposes of local charges, and he referred to various Acts of Parliament (which I will now proceed to consider) as showing what the meaning of the words "annual value" is in this local Act in question. The first Act Mr. Taylor referred to was 6 and 7 William IV., c. 96, sect. 1—the Parochial Assessment Act—which directs the poor-rate to be made on an estimate of the net annual value, which it then proceeds to define; but it will be observed that the words in that Act are not simply "annual value," but "net annual value." Now, I think, *primâ facie*, "net annual value" means something less than annual value pure and simple; and, therefore, I do not think the Parochial Assessment Act furnishes any safe guide to the meaning of the words "annual value" in the Act I have to interpret. And, indeed, Mr. Taylor seemed rather chary of pushing his argument to its full result, for he, or at least his client, said he should be content to pay for No. 5, Esplanade, upon the gross estimated rental of £55, and not only upon the rateable value. Mr. Taylor's next Act in order was the Highway Act—5 and 6 William IV., c. 50, sect. 29, which provides that "every rate shall contain the names of the occupiers, the description of the premises or property they occupy, and the full annual value of such premises or property," &c. In that Act the words are "full annual value;" but that Act passed the year before the Parochial Assessment Act, and, till the latter Act passed, it is well known that scarcely any two parishes had the property in them assessed alike; some were assessed at one proportion of the rental, others at another, and there was no uniformity; and it is, therefore, impossible to take the Highway Act as a guide. The next Act Mr. Taylor referred to was the County Rates Act, 15 and 16 Vic., c. 81, sect. 6, which is as follows:—"For the purpose of preparing any such basis or standard for assessing any county rate, the words "full and fair annual value" shall be taken to mean the net annual value of any property, as the same is or may be required by law to be estimated for the purpose of assessing the rates for the relief of the poor." Now, it appears to me the section I have just quoted makes much more against the defendant than for him, for what is the fair inference from it but this, that the words "full and fair annual value" have naturally a different meaning to that put upon them by that section, and that it was necessary to put a non-natural meaning upon them to carry out the object of the Legislature. Next in order is the Local Government Act, 21 and 22 Vic., c. 98, sect. 55, but that only requires the general district rate to be made on the same basis as the poor-rate; but neither the Lowestoft Local Act nor the Water-Works Clauses Act, 1847, require the water-rates to be made upon that basis. And, lastly, Mr. Taylor referred to the Parochial Assessment Act, 25 and 26 Vic., c. 103, sect. 28, which commences thus: "In every parish where a valuation list under this Act has been approved and delivered to the overseers, no rate for the relief of the poor or other rate which by law is required to be based upon the poor-rate, shall be of any force unless the hereditaments included in such rate, except as hereinafter provided, be valued according to the annual value thereof appearing in the valuation list in force in such parish." Now, I apprehend the words "which by law is required to be based upon the poor-rate" must mean "required by the Act under which the rate is imposed." But neither the Lowestoft Local Act under consideration nor the Water-Works Clauses Act, 1847, require the water-rates to be based upon "the poor-rate," and therefore the Lowestoft valuation list does not govern the water-rate at all. I have now gone through all the Acts referred to by Mr. Taylor, and he has not satisfied me that any of those Acts show that a meaning other than their common natural meaning is to be put upon the words "annual value" in the 32nd section of the local Act, and in section 68 of the Water-Works Clauses Act, 1847. Had the Legislature intended to put any restricted or defined meaning upon those words, they would have done so, for I find in section 3 of the Water-Works Clauses Act, 1847, meanings assigned to several words and phrases used in the Act, but the words "annual value" do not appear in that 3rd section. I think, therefore, and have come to the conclusion, after full consideration, that the natural meaning only is to be assigned to the words "annual value" in the Act under consideration; and, considering that the occupiers are the parties to pay, and that the houses they occupy are worth to them the rents they pay, I can only put this meaning on the words "annual value," namely, that they mean what the house will let for. And, in conclusion, I would observe that this water-rate is not a rate of the same nature as poor-rates or highway-rates, which every occupier of real property is liable to pay, but is merely levied to pay the company for the water they supply. If Mr. Bean chooses, he can give notice at once to the company to shut off the water from his houses, and he need no more be troubled with water-rates. I am of opinion, therefore, that the plaintiffs are entitled to the judgment of the court; and as Mr. Bean has now a second time put the company to the proof of their case, and as he alone out of the whole of the consumers of water in Lowestoft has chosen to dispute the company's claims, he must pay the plaintiffs costs; and I hope this will be the last I shall hear of Mr. Bean and his water-rate.

Judgment for plaintiffs, with costs.

Miscellaneous News.

HASTINGS AND ST. LEONARD'S GAS COMPANY.

The Half-Yearly Meeting of the Proprietors was held on Friday, Sept. 8.—R. DEUDNEY, Esq., in the chair.

The notice convening the meeting having been read by Mr. W. B. YOUNG, the report and statement of accounts were presented. The report was as follows:—

An opportunity having offered itself for the advantageous purchase of about three-quarters of an acre of land adjoining the factory, the directors, having regard to future requirements, have arranged for the purchase of the same.

They have also resolved to sell the small piece of surplus ground at the entranceto the factory; but a feeling having been expressed by some shareholders that this was undesirable, they have postponed the subject for discussion at this meeting.

In consequence of the increase in the company's business, it is found necessary to have additional capital for carrying on the same, The directors have, therefore, deemed it expedient to raise a sum of money by the further issue of new shares.

The factory and mains are throroughly efficient and in the highest state of perfection, and at present require no additions or essential repairs.

The accounts, duly audited, leave a balance of £2841 17s. 2d. for the half year's profit, which, with the £31 7s. 7d. brought on from last year, gives the amount of £2873 4s. 9d. available for dividend; and it is recommended that a dividend be paid at the rate of 8 per cent. per annum on the old shares, and at the rate of 7 per cent. per annum on the new shares; that £100 be paid off the No. 2 gasholder account, and £50 be carried to the credit of the suspense account; leaving a balance of £23 4s. 9d. to be carried forward to the next half year.

The following three directors retire by rotation—viz.: Mr. W. Scrivens, Mr. N. Parks, and Mr. E. Hayles; one auditor, Mr. W. Hallaway, also retires by rotation on this occasion: and all four gentlemen are eligible for re-election.

The CHAIRMAN, in moving the adoption of the report, said, in reference to the first paragraph, that a favourable opportunity having arisen to purchase about three-quarters of an acre of land, adjoining the large gasholder, which would eventually be required, the purchase had been agreed upon. It was thought that the strip of land at the entrance of the works might be sold, and would realize the £820 which the company had to pay for the new acquisition. Under these circumstances, notice was given to sell the land by auction. Whether the step would have been for good or evil he could not say; but, at at any rate, it would only be a question of adding a little to the capital, and paying a little more interest out of the dividend. In the next place, the directors said they wanted more capital to carry on their increasing business, and it was for the shareholders to say how the capital should be raised. The proposal of the directors was before them; but some might have other views, which the board would be glad to hear. The visitors book contained entries to show that the works were as perfect as any of the kind in the country, and it was very desirable they should be kept so. He was glad to say that there was an increase in the amount received from private rentals to the extent of £663, but in the public rentals the increase was only £17. It appeared to him that the local board had been exceedingly cautious in spending money for lamps, but he thought they might give the public a few more. Though the sale of coke was large, there had not been the demand for it there was last year. No doubt the price of coal affected the consumption of coke. If they found this was the case, the price must be reduced. In other items the receipts had not been so large. Last year tar became almost valueless, and there was a difficulty in getting rid of it. The difference in the receipts, comparing one year with the other, was £116. Of course every £100 was important, because there was not a large overflow in any other way, the price charged for gas being so low. He felt confident that the increase of dividend was only a question of time; but, so long as the suspense account remained, and there were debts to pay off, shareholders must not expect to get a larger dividend. As men of business, the first object must be to get rid of the debts, and then, in two or three years, something might turn up. The increase in rentals had been 7½ per cent. in the last half year. All he could advise was that they should use more gas, and then the increase would soon be 15 per cent. He concluded by moving the adoption of the report, and the payment of the dividend recommended.

Mr. GAUSDEN asked what was the feeling of the directors with reference to the land at the entrance, which from the report appeared to be left an open question, to be considered by the meeting.

The CHAIRMAN: We think it would be wise policy not to sell the land at present, and circumstances may occur shortly by which we can make a better use of the land. As the town grows the board may perhaps turn it to public purposes, or may do something to make it ornamental as well as useful.

Mr. GAUSDEN had much pleasure in seconding the chairman's motion. There had been a strong feeling on the part of some of the shareholders about the sale of the ground, but it was not a feeling of hostility to the directors. The board was composed of men of business, who usually carried out all matters connected with the company with discretion. He was very glad to find the directors had come to the determination which the shareholders had anticipated.

The motion was unanimously carried.

The CHAIRMAN moved the re-election of Messrs. W. Scrivens, N. Parks, and E. Hayles as directors for the ensuing three years.

Mr. PICKNELL seconded the motion, which was carried.

On the motion of Mr. G. A. THORPE, Mr. William Hallaway was re-elected auditor.

Messrs. HAYLES and PARKS and Mr. HALLAWAY returned thanks for their re-election.

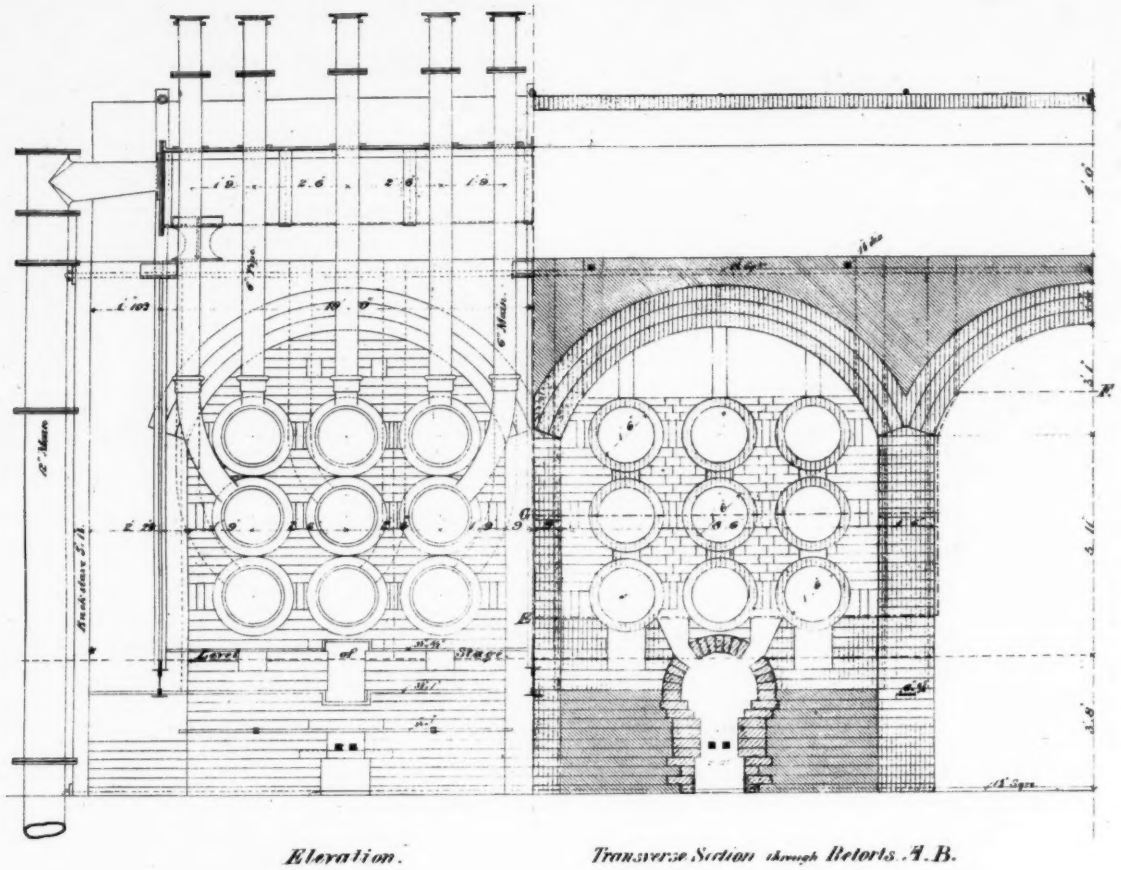
An extraordinary meeting was then held, to authorize "the further issue of 750 new shares at £20 each (being a further portion of the 3000 shares created by a resolution passed at a meeting of the shareholders held on the 14th of July, 1865), and for the purpose of deciding how such 750 shares, or any part of them, shall be disposed of."

A series of resolutions on the subject, which the directors recommended for adoption, were submitted, and after some conversation thereon were adopted, with a slight amendment with reference to the disposal of any surplus shares, the arrangement for which was left in the hands of a committee of three directors and three shareholders.

Messrs. Gausden, Brown, and Veness were appointed the shareholders representatives on the committee.

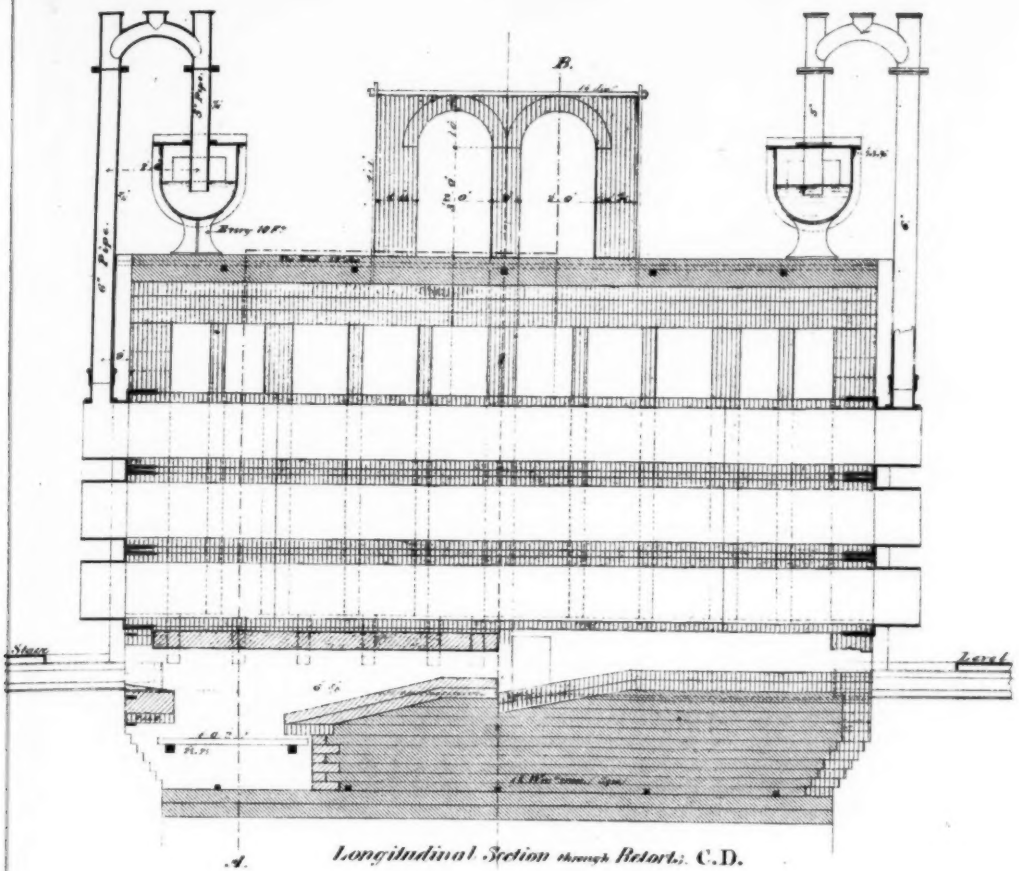
The meeting terminated after thanks had been accorded to the chairman, the clerk, and the manager.

After the meeting, Mr. A. H. Wood, manager of the company, conducted a party of shareholders over the works, and explained the numerous details observed in carrying on the process of gas manufacture, and the plans for saving labour and checking the work done; also his simple mode of manufacturing oxide out of the old scrap iron, which he finds very economical and effective. The visitors very warmly thanked Mr. Wood for his interesting explanation, before separating.



Elevation. Transverse Section through Retorts A.B.

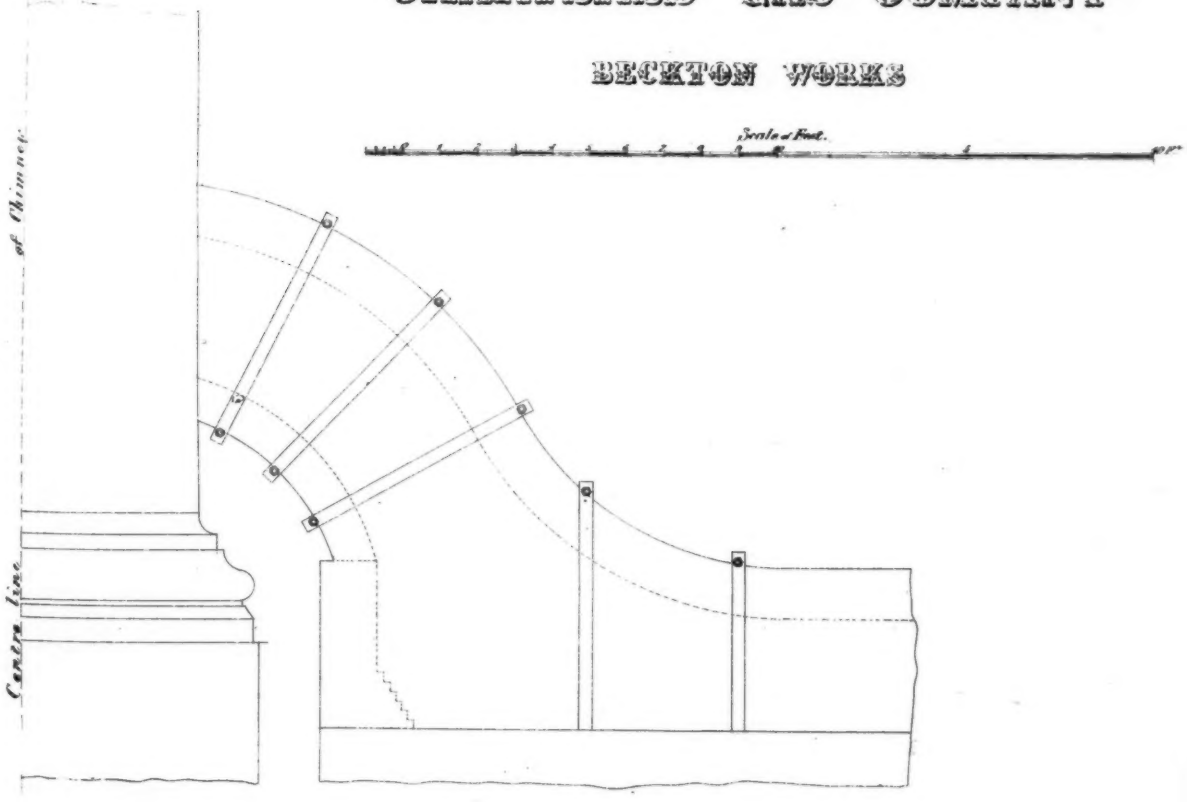
Photo-Lithographed by Whiteman & Bass London.



A. Longitudinal Section through Retorts C.D.

CHARTERED GAS COMPANY

BECKTON WORKS



Elevation at Flue next Chimney.

BIRMINGHAM GASLIGHT AND COKE COMPANY.

The following is the report of the directors to the 104th half-yearly meeting, to be held to-morrow:—

"In presenting to you the accounts for the half year ending the 30th of June, 1871, we can with great confidence repeat the statement made in our last report as to the continued satisfactory state of the profit and loss account, that it shows an increase over the corresponding half year of 1870, both in gas-rentals and the proceeds of coke and residuals.

"The works and plant of the company have been maintained in a state of thorough efficiency, and after paying all working expenses, and making adequate allowances for bad and doubtful debts, the balance available for dividend amounts to £13,048 0s. 8d.

"It is with deep regret that we have to report, concurrently with so satisfactory a condition of the revenue account, that it is necessary to make a large deduction from the reserved fund, in consequence of recently discovered defalcations by your late secretary, Mr. Joseph Harrison, and deficiencies in the accounts of some of your collectors. All the information we have been able to obtain on this subject is at the service of the shareholders, but the history of the matter is as follows.

"The system of keeping the company's accounts was devised by one of our number who has been repeatedly honoured by your confidence, as shown by continuous re-election. It has been from time to time, up to the last half-yearly meeting, approved of by auditors elected by you; but, unfortunately, it has not, as the event has proved, been found effectual against a combination between your secretary and at least one of your collectors systematically to falsify the accounts. The confidence reposed in this system was not confined to us, or to your non-professional auditors, for on the first occasion on which a professional audit was made—viz., by Messrs. Roberts, Malins, and Coleman, in Sept., 1868—they reported as follows:—

"'In accordance with instructions we have been favoured with by the auditors of the Birmingham Gaslight and Coke Company, we beg to report that we have examined the accounts for the six months ending June 30, 1868. We have had access to whatever books, papers, and documents we deemed it advisable to inspect, and have derived much advantage from the elaborate system of checking already adopted by your chairman. We have likewise been greatly aided by the information and explanation which have been most readily afforded by your secretary.'

"No further professional investigation of your accounts took place until the last half-yearly meeting, when the auditors appointed at the meeting in September, 1870—Mr. George Beech, accountant, and Mr. Edward Bembridge—commenced their duties. Your auditors examined as many of the details of the accounts as the short time allowed would permit; and although no discrepancies or irregularities were then discovered, both they and the majority of the board came to the conclusion that the very numerous details, of which the totals were made up, could only be satisfactorily verified by a continuous audit; and it was by a dexterous falsification of such details that the frauds were effected.

"In June last the board commenced a call-over of the whole of the accounts, and upon this one of your collectors, William Henry Blundell, absconded, to avoid the detection which he well knew must follow such an examination. We immediately caused a warrant to be issued for his apprehension, and instructed your accountant-auditor, Mr. Beech, to make a full and thorough investigation of all the company's accounts. This was on the 19th of June, and up to that time there appeared to be no error in the late secretary's accounts, except the non-payment of a sum of about £100 due from him, as treasurer of the Birmingham Dog Show, to the company. On the 27th of June, however, before any discovery had been made which would have justified proceedings, civil or criminal, against him, Mr. Joseph Harrison left the country. A warrant was obtained as soon as any facts were ascertained which would justify it, and both in his case and Blundell's, every effort to execute the warrants has been made, but hitherto without success. The progress of the investigation disclosed, as has been stated, a systematic falsification of the accounts, by a conspiracy between Harrison and Blundell, and it is feared with the knowledge, if not the connivance, of others of the collectors. This was effected by bringing forward, quarter after quarter, as arrears, sums which had been paid to the collectors or the counter clerks, and not accounted for by them. The same course was pursued by the secretary with respect to the accounts for cokes and sundries, of which he had the collection, and the magnitude of these sums accounts for the largeness of his deficiency. The amount so embezzled could, of course, only be ascertained by the investigation of each customer's account, a matter which has necessarily occupied much time and labour. After a thorough investigation, we state with confidence that the sums reported in the balance-sheet substantially represent the total of these losses. With respect to the collectors other than Blundell, although their conduct in not disclosing to us, if not conniving at, the irregularities of which they were aware, was most reprehensible, we were advised by your solicitors, *and also by counsel*, that no criminal proceedings could be sustained; we therefore obtained as much money compensation from them or their sureties as we could get, and as such payments were made to prevent exposure, we cannot, as in other cases, publish the names of such collectors.

"The defects in the management and in the system of accounts, which the late unfortunate events have made patent, we have done, and are still doing, our best to remedy. We congratulate the shareholders on having secured a most zealous and efficient officer in your new secretary, Mr. Joseph Slocombe, with whose assistance we have been able to make most important improvements in the mode of keeping the accounts, and in the general management of the company.

"We are satisfied that we have accurately estimated the loss consequent on the events we have reported, and the result is that the company has lost the greater portion of its undivided profits. This, although much to be regretted, does not affect any of the elements on which the present and future prosperity of the company depend.

"We have the satisfaction of knowing that your revenue is increasing, and is likely to increase; that your works are in an efficient state; and that the organization of your business arrangements has been greatly improved.

"Henceforth these things will be more vigilantly supervised by us; and therefore we look forward with confidence to a future of prosperity for your company.

"Shortly after the last half-yearly meeting, Mr. John Chesshire, who succeeded Mr. Lucas as chairman, in September, 1868, resigned his office, both as chairman and director. We elected Mr. Edwin Yates in his place, and appointed our late deputy-chairman, Mr. Morris Banks, to be chairman, and Mr. J. T. Collins to be deputy-chairman of the board. Mr. Roger Holinsworth has resigned his office as a director, and in his stead we have appointed Mr. Edmund Boughton. Mr. S. V. Horton has also resigned his office, but we have not filled up the vacancy. The directors who retire by rotation at this meeting are Messrs. Lucas, Collins, and Boughton. Mr. Lucas had some time ago intended to retire at Midsummer, and therefore does not offer himself for re-election; but Messrs. Collins and Boughton, being eligible, offer themselves accordingly.

"We have deemed it advisable to leave to you the filling up of the two vacancies occasioned by the resignation of Mr. S. V. Horton, and by the determination of Mr. S. W. Lucas not again to offer himself for re-election; but we have confidence in placing before you the names of Messrs. Edward Bembridge and James Watson.

"After mature consideration of your present position and future prospects, we have decided to recommend the payment (free of income-tax) of the usual maximum dividend, after the rate per annum of 9 per cent. on class A and B shares, and 7½ per cent. on the new ordinary shares, payable on the 30th of September inst.

The balance available for dividend, mentioned in the second paragraph, amounts to	£13,048 0 8	
And the dividend recommended will absorb	11,517 14 7	
Leaving to be carried to the reserve-fund	£1,530 6 1	

"Signed on behalf of, and by order of, the directors,

"MORRIS BANKS, Chairman."

Balance-Sheet, June 30, 1871.

Dr.				*Cr.*			
To Shares raised under Birmingham Gas Act, 1855, 18 Vict., cap. 48—				By Total plant, cost of works, mains, meters, &c., to June 30, 1871			
1200 class A, limited to 9 per cent., at £80			£96,000 0 0	Amount owing to the company for gas, cokes, residuals, fittings, &c., exclusive of estimated bad debts, discounts, and commissions			£318,200 4 4
400 „ B, „ „ „ 8			3,200 0 0				49,226 4 9
3750 „ N.O., „ 7½ „ „ 40			150,000 0 0	Advanced on mortgage			4,000 0 0
1270 „ N.O. (1866), limited to 7½ per cent., at £40	£50,800 0 0			Cash on deposit account at Birmingham Banking Company, Limited			4,656 4 0
Less unpaid	140 0 0			Stock-in-trade—viz., coal, cokes, residuals, and fitting materials			13,952 5 2
			50,660 0 0	Cash at bankers and in hand			13,944 9 11
Per same Act, not bearing dividends			3,716 0 0	Balance due for rents			4 16 5
„ loans on the bonds of company			70,500 0 0				
Unpaid dividends			20 6 6				
Trade debts and interest on loans owing by the company			16,489 1 9				
Reserved fund			350 15 8				
Balance from profit and loss account			13,048 0 8				
			£403,984 4 7				£403,984 4 7

Reserved Fund, June 30, 1871.

Dr.			*Cr.*		
To Defalcations—			By Balance-sheet, Dec. 31, 1870		£27,172 15 8
Joseph Harrison	£17,907 0 2		Interest to June 30, 1871		483 8 4
Collectors, less estimated value of assets recovered	8,173 3 6				
	£26,080 3 8				
Errors in accounts, and bad debts and discounts not previously written off	1,225 4 8				
Balance carried to balance-sheet	350 15 8				
	£27,656 4 0				£27,656 4 0

Profit and Loss, Half Year ending June 30, 1871.

INCOME.			EXPENDITURE.			
Balance brought forward from Dec. 31, 1870		£1,529 18 1	Management—			
Sale of gas, after deducting discounts, adjustments, and bad debts, and expenses of public lamps		37,896 10 8	Office salaries, collectors commissions, and payments to directors and auditors	£2,898 18 10		
Coke and breeze		14,326 11 0	Stationery, printing, incidental expenses, and wear and tear of fixtures	417 19 7		
Tar, ammoniacal liquor, sundries, and profit on fittings		5,778 19 8			3,316 18 5	
			Manufacture of Gas—			
			Coals, including tonnage and delivery	£27,749 12 5		
			Purifying materials and wages	559 2 6		
			Supervision and labour	7,322 2 8		
			Retorts, tools, and implements, with ordinary repairs and maintenance of premises	1,440 2 6		
			Levies, rates, and taxes	1,513 3 4		
			Ground-rents upon leasehold works	81 16 8		
					39,666 0 1	
			Distribution—			
			Ordinary repairs, and maintenance of mains, with costs and repairs of services		1,528 17 6	
			Meters—			
			Restoring and maintaining		677 2 9	
			Parliamentary and law expenses		104 8 5	
			Interest on loan capital		1,835 16 9	
			Bank charges, less discounts		354 15 4	
			Balance applicable for dividends		13,048 0 8	
		£59,531 19 5				£59,531 19 5

Examined and found correct,

GEORGE BEECH, Public Accountant,
EDWARD BEMBRIDGE, } *Auditors.*

(Signed)

MORRIS BANKS, *Chairman.*
JOSEPH SLOCOMBE, *Secretary.*

Sept. 15, 1871.

BIRMINGHAM AND STAFFORDSHIRE GASLIGHT COMPANY.

The following is the report of the directors for the half year ending the 30th of June, 1871, to be submitted to the next half-yearly meeting:—

"By reference to the accompanying balance-sheet, which has been duly certified by a public accountant, it will be seen that the amount available for dividend is £25,310 17s. 3d., out of which the directors recommend the payment of the usual dividends amounting to £23,988 15s., leaving a balance of £1322 2s. 3d.

"The item in the profit and loss account for repairs and maintenance will probably be thought unusually large, but this has been mainly owing to the renewal of a gasholder at the Saltley works.

"The directors have pleasure in stating to the proprietors that the loan debt has been reduced, and that it now stands at only £13,825, and that it is their intention to pay off the whole as soon as circumstances will permit.

"At this meeting the following directors, Mr. Luckcock and Mr. Rotton, retire by rotation, and, being eligible, offer themselves for re-election.

"The directors have annexed a report of their engineer, showing the very satisfactory condition of all the works of the company.

"WILLIAM SHARP, Chairman."

"Gentlemen,—I beg to lay before you the following report for the last half year:—'The mains have in many places been enlarged and extended, and an additional bench of retorts has been erected at your Saltley station, and the gasholder, which is being renewed there, will be ready for use by the beginning of next month. The whole of your works are in a thoroughly efficient state.

"'HUGH YOUNG.'"

Dr. *Profit and Loss Account, June 30, 1871.* *Cr.*

To Coals	£47,677	6	10	By Balance brought from last year's account	£29,624	8
Purifying materials and process	570	10	6	Sale of gas, after deducting £5000 for estimated discounts and bad debts	69,770	8 8
Repairs and maintenance of meters, mains, service-pipes, and other works	17,964	6	9	Coke and breeze	24,549	6 4
Wages	8,549	18	0	Tar and other residuals, and fittings	9,138	4 11
Lamps (providing, lighting, extinguishing, cleaning, and repairing)	984	3	7	Miscellaneous	126	17 2
Rates and taxes	3,159	6	8			
Salaries, collectors commission, and payments to directors	4,807	13	2			
Interest on loans	468	10	8			
Professional charges and incidental expenses	1,196	12	0			
Dividends paid to proprietors—viz., 10 per cent. per annum on £320,400. Capital raised under Act of 8 & 9 Vict., cap. 66	16,022	0	0			
Seven and a half per cent. per annum on £200,000, raised under Act of 21 Vict., cap. 1	7,500	0	0			
Balance carried to next half year's account	25,310	17	3			
	£133,209	5	5		£133,209	5 5

Dr. *Balance-Sheet, June 30, 1871.* *Cr.*

To Capital raised under Act 8 & 9 Vict., cap. 66	£320,400	0	0	By Cost of works, Dec. 31, 1870	£535,668	2 10	
" " " Vict. 21, cap. 1	212,500	0	0	Add extensions made during the half year	4,153	13 7	
" " " Vict. 27 & 28, not bearing dividend	10,906	0	0			£539,821	16 5
Amount of loans	13,825	0	0	Amount invested of the reserved fund		42,942	19 7
Reserved fund	60,249	16	9	Calls unpaid		6	0 0
Amount owing by the company	29,201	8	9	Amount owing to the company for gas, cokes, residual products, fittings, &c. (exclusive of estimated discounts and bad debts)		69,451	16 8
Unclaimed dividends	247	12	9	Coals in stock		7,990	0 0
Calls prepaid	5,732	0	0	Residual products, and other stock		4,208	13 11
Balance as above	25,310	17	3	Cash in hands of treasurer and cashier		13,451	8 11
	£677,872	15	6			£677,872	15 6

Birmingham, Sept. 9, 1871.

EDWIN LAUNDY, *Public Accountant.*

BIRMINGHAM WATER-WORKS COMPANY.

The Half-Yearly Meeting of the Shareholders of the Birmingham Water-Works Company was held at the Offices, Islington, on Wednesday, Sept. 20.—Mr. W. JAMES in the chair.

The CHAIRMAN moved the approval of the report and accounts, which showed that the past had been a profitable half year. There is a divisible profit of £15,910, which makes the increased receipts on the year £3852. The current profits, added to a balance from last account, furnish a dividend at the rate of 6½ per cent. per annum, and leave £3729 to be carried forward. The works, engines, and machinery of the company are in good order, and the additional engines and engine and boiler house at lower Edgbaston, referred to in the last report, approach completion. The supply of water at Aston Well having much increased, the directors have contracted for a larger pump for that well. The sinking as King's Vale continues to yield but a small supply. The engine and engine and boiler house at Shortheath are nearly completed, and although these works have been expensive, the directors have reason to hope for such supply therefrom as will fully compensate for the expense incurred. The sinking near Perry is yielding a regular good supply of water, and it is anticipated that by extended operations the quantity will be increased. Part of the land required for the Blythe and Bourne supply has been purchased, and the works near the Whitacre railway station, consisting of reservoir, filter-beds, engines, engine and boiler house, and workmen's cottages, are being proceeded with as fast as possible. The supply-main from Plant's Brook to the engine at Whitacre is also going on satisfactorily, and is completed from Plant's Brook to Water Orton, passing under the river Tame at the latter place. It is expected that this supply will be available for use in the course of the year 1872. During the present year negotiations have been entered, and have resulted in an agreement that the South Staffordshire Company should, for the sum of £1650, transfer to this company the right of supply of the whole parish of Handsworth. The chairman said they had had this last half year a great deal of work, which he was glad to say was all going on very satisfactorily. The arrangement with regard to Handsworth, by which the supply of that district was now vested in the hands of the company, was satisfactory to both sides—to this company and the South Staffordshire Company. The pumping at the various wells was also going on all right, and it might be satisfactory to the shareholders to know that during the past week, up to Friday night, their well water was 31 millions—that was upwards of 4 millions per day pumped from the wells. The whole supply to the town was something like 7 millions, so that more than one-half was well water. By the works which were being carried out, he hoped in the present year the supply of well water to the town would be very largely increased.

Mr. RAWLINGS seconded the motion, and asked if the law expenses, which were larger than usual, should not be charged to capital instead of income.

The CHAIRMAN said the matter was under discussion, and it was decided that it should be charged to income, because it was not considered that it improved their works.

Mr. RAWLINGS said there was one other matter to which he wished to refer, and that was with regard to the auditing of the accounts of the company. They were aware that there was a case of——

The CHAIRMAN: Name, name, please.

Mr. RAWLINGS: The old gas company. He had the greatest confidence in the directors and the auditors, but they ought to avail themselves of every opportunity to make the company as safe as possible. He was aware that they could not appoint auditors beyond the number allowed, but they could recommend to the three auditors to appoint a professional man, which they could do. The cost would be a mere bagatelle, and he was sure the change would give great satisfaction to the shareholders generally. He was a large owner himself, and he believed this step would place the company in a sounder position than even it was at present, if that was possible.

The CHAIRMAN said this was a question for the auditors and shareholders more than the directors. The law as it at present stands was, he considered, very good and very sound—that was that the directors should keep proper accounts. They had to lay the accounts before the three auditors, and the directors never interfered with the choice of the shareholders. He was sorry that Mr. Rawlings was so alarmed at what had taken place in any other company. The only annoyance and inconvenience he felt about what had taken place at the gas company was nothing more nor less than this—it shook their confidence and faith in their fellow-men. As for himself, however, he had not arrived at that miserable state when, because one man was a thief, he should suspect all others. What had taken place at the gas company merely strengthened him in his former course—to keep his eyes and ears wide open, and to take advantage of everything he heard and saw. He could not, however, allow a comparison to be drawn between, even by inference, the bad book-keeping of another company with the good book-keeping of their own company. With good management the frauds of the Birmingham Gas Company ought to have been discovered years ago by the directors themselves, and not by any other person. An auditor could only examine the figures in the books, and not those out of them; and as to the motion which Mr. Rawlings proposed to submit, he could not undertake to put it to the meeting.

In reply to a shareholder,

The CHAIRMAN said the system of sending the accounts was, the collectors took them out, and if the accounts were not paid, then circulars were sent out at once, independent of the collectors. If they were not successful, a second and a third circular were sent out.

Mr. COPE (auditor) suggested that an expression of opinion should be taken showing the sense of the meeting with regard to appointing a professional accountant.

Mr. EDWARDS (auditor) explained how the accounts were at present audited, and said the strictest inquiry was made into every item.

Mr. W. H. DEYKIN (auditor) felt so strongly on this question that he had come to the meeting with a resolution in his pocket, urging that a professional auditor should be appointed, but he had been told by the chairman that he could not put a motion of that kind. He had not agreed with his two colleagues on this point, and as he was now an old man he begged to tender his resignation.

Mr. COPE said perhaps it would be as well if Mr. Deykin, who hardly correctly represented what had taken place between the auditors, did retire.

After a long discussion, Mr. RAWLINGS adopted the suggestion to take the sense of the meeting, and moved—"That the shareholders present are in favour of the appointment by the auditors of a public auditor."

Carried unanimously.

Mr. RAWLINGS: I trust that that expression of opinion will be quite sufficient for the auditors to act upon.

The CHAIRMAN then put the motion that the report be approved, and that a dividend at the rate of 6½ per cent. be declared, which was carried unanimously.

Mr. COPE moved, and Mr. W. H. DEYKIN seconded, and it was carried, that the accounts of the directors be approved.

Mr. EDWARDS, in accordance with the notice given at the last meeting, moved, in a speech eulogizing the services rendered by the directors to the company, that their remuneration be increased to £1000 a year.

Mr. W. H. DEYKIN said he was completely taken by surprise by his old colleague, because it had been agreed that the motion should be to increase the remuneration by £350, making the total £800. He moved an amendment to this effect.

At the suggestion of Mr. RAWLINGS, the sum was fixed at £900, and Mr. EDWARDS having adopted this, and Mr. DEYKIN having withdrawn his amendment, the resolution that the remuneration of the directors should be £900, was put and carried.

The usual vote of thanks to the chairman brought the meeting to a close.

SOUTH METROPOLITAN GASLIGHT AND COKE COMPANY.

An Extraordinary Meeting of the Proprietors of this Company was held at the London Tavern, on Thursday, Sept. 14—THOMAS BRIDGE SIMPSON, Esq., in the chair—for the election of a director in the place of Mr. Ewart, deceased.

The SECRETARY (Mr. Livesey) having read the notice convening the meeting,

The CHAIRMAN said the only business to be submitted to the proprietors was the election of a gentleman to fill the vacancy caused by the death of their late deeply-lamented colleague, and he could not but express the satisfaction he felt in seeing so many present at the meeting.

Mr. GRAY said he had been informed that Mr. Paull, who was a candidate for the vacant office, had been in communication with the directors, and had intimated that on the present occasion he would not put the meeting to the trouble of a division. Mr. Paull felt that Mr. Hill, the other candidate, was in every way well qualified to fill the post to which he aspired, and therefore he retired in favour of that gentleman. Mr. Paull would have been pleased had the suffrages of the meeting placed him on the board, and there could be no doubt that in such a position he would faithfully discharge his duty to the proprietors. Having, however, on this occasion, as on two or three previous occasions, withdrawn from pressing his claims to the honour of becoming a director, he hoped that when a future vacancy occurred he might be kindly remembered by the proprietors. He (Mr. Gray) was quite aware of the merits of Mr. Hill,

and therefore, though he had hitherto supported Mr. Paull's candidature, he felt there was now no inconsistency in moving the election of Mr. Hill as a director. This motion would, doubtless, meet the unanimous approval of the meeting, and he believed that when Mr. Hill took his seat at the board, his colleagues in the direction would receive from him most valuable assistance and co-operation. He would add no more than the expression of his deep and unfeigned regret that this election was rendered necessary by the death of Mr. Ewart—a man held in universal esteem, and a personal friend of his own, for whom he entertained the highest regard.

Mr. BAILEY seconded the motion, which was at once put to the meeting, and carried unanimously.

Mr. PAULL said he had been a candidate for a seat at the board on three occasions, and he hoped at the next vacancy he should receive that amount of support which would place him in so enviable a position. While acknowledging his obligations to those who had confided to him their proxies, and expressing a hope that he might ultimately be successful, he congratulated Mr. Hill on the result of his appeal to the proprietors, and concluded by proposing a vote of thanks to the chairman.

Mr. HILL said he was exceedingly obliged to the proprietors for the honour they had done him in electing him on the board of one of the most successful companies in London—an honour to which he had been looking forward a long time. There were very few things in this world which, in themselves fortunate, were unaccompanied with causes of deep regret, and he must say that the death of Mr. Ewart was an event which materially diminished and dimmed the satisfaction he experienced in taking his seat as a director of this company. Mr. Ewart was a man whose character was well known and respected. He was a man of business and decision, and, above all, a kind and good man. He (Mr. Hill) owed his thanks to Mr. Paull on this occasion for not putting the proprietors to any unnecessary trouble in connexion with the business of the day, and especially for the generous manner in which, before the commencement of the meeting, he had assured him of his continued friendship. It was said that everything was fair in love and war; he was sure that in the contest just concluded Mr. Paull felt that only what became a man and a gentleman was fair in such a war; and acting on this principle, everything on his part had been conducted in the most kind and gentlemanly way possible.

The vote of thanks to the chairman was put, and carried unanimously.

The chairman acknowledged the vote, and the proceedings terminated.

ON THE QUALITY OF THE WATER SUPPLY OF SOME OF THE LARGE CITIES AND TOWNS OF ENGLAND AND SCOTLAND IN RELATION TO THEIR SANITARY CONDITION.

By H. LETHEBY, M.B., M.A., &c.

[Read before the Association of Medical Officers of Health, on Saturday, May 20.]

In the course of a rather large professional experience of the quality of the water supplied to the cities and towns of this kingdom, I have had an opportunity of inquiring into the relation of such supply to the public health; and my attention has been especially directed to the comparative value, in a sanitary point of view, of hard and soft waters. The result of these investigations is an unmistakeable advantage in favour of a moderately hard water, such water being not only brighter, cooler, more sparkling, and therefore more agreeable to the eye and to the palate than soft water, but also less likely to absorb organic miasms, to become charged with living organisms, and to act upon lead and iron, than soft water. In addition to which there is strong evidence of the fact that the calcareous matters of such water minister to the physiological wants of the animal system, and protect it from many unwholesome influences.

I intended, at the time when my paper was announced, to have entered very fully into these questions, but the pressure of other professional work, as well as the difficulty of obtaining accurate information of the population and death-rates of the large towns of this country, has compelled me to postpone the subject to a future occasion, when I shall have access to the results of the recent census. It is, fortunate, however, that the question of the comparative advantages of hard and soft water has been recently commanding the attention of the people of Edinburgh who are opposed to the corporation scheme for the supply of that city with soft water from St. Mary's Loch, instead of from the Pentlands, the Heriot, and the South Esk, where the water is moderately hard; and the subject has been so ably discussed in a series of letters in the *Scotsman* by a physician (Dr. Wilson, of Edinburgh), that I make no apology for submitting them to you in an abbreviated form, with such comments as my own experience suggests.

In the first place, it is argued that lake water is vapid, mawkish, unaërated as regards carbonic acid, of unstable temperature, and is so prone to be loaded with decaying vegetable and animal organisms as to have been regarded with repugnance in all times. "Frontinus, who was curator of the Roman aqueducts in the first century of our era, when speaking of the now no longer flowing Aqua Alsietina as drawn from the lake of Martignano, wonders how Augustus could determine to bring into Rome 'a water of so little agreeableness and salubrity, and which had never come into popular use and favour,' and accounts for it by his having required it for his shows of mimic sea-fights. And, to leap thence to the close of the seventeenth century, it is in like terms that Fabretti, also a great authority on aqueducts, complains of the deterioration of the original waters of the Trajan aqueduct, through their admixture with those of Lake Bracciano by Pope Paul V., a combination which still exists as the least prized and used for domestic purposes of the famous aqueducts of Rome."

In more modern time, "the city of Boston, in the United States, is one of the few communities that imprudence has hitherto led, or necessity driven, into the use of a lake water, their supply being from Lake Cochituate, situated at some distance. In a paper published in *Silliman's American Journal of the Sciences* (vol. xix.), Dr. Hayes, the Assayer to the State of Massachusetts, describes the 'numerous animalcules and infusoria, fresh water sponges, and abundance of ochry matter, resulting from the chemical action of the water on the iron pipes,' to be met with in this water. It is only consistent with this that he finds in it an affinity to 'putrid waters;' and states that 'there are periods in every season, during which it closely approaches to these in character.' In one October, 'the general supply of water had become very offensive.' The water fleas increased in quantity and in size (from 1-8th to 1-6th of an inch), and 'the cotton filters were soon closed by their bodies;' and in these fleas was detected the chief cause of the offensiveness, consisting in an oily matter in their bodies. The peculiar flavour of the water continued as bad in January as it had been in autumn." In illustration of this I may state that it is no unusual circumstance for living organisms to be so rapidly and abundantly developed in water containing food for their growth, as to become actually offensive. I have known instances of water becoming putrid by the death and decay of such organisms in the main and service pipes of a town. In the case of St. Mary's Loch, according to Dr. Frankland, it was necessary to strain off the fleas from the samples of water before they could be analyzed; but as I gather from his published evidence in the case, he only did this "because the process of analysis is so delicate that a couple of these fleas, or three or four of them, would have produced a very perceptible difference in the result;" but he thought there was no harm in them, for, to use his own words, he said "he had seen them repeatedly in waters of very good quality. The Manchester water very frequently contains them, delivered in the town, and that is justly considered one of the best waters in the kingdom; he added that he had drunk it himself for six years; and when he was asked what would be the result of taking these fleas into the human frame, his answer was, "just the same result would follow, I should think, from taking shrimps." The import of all this is, to my mind, very different from that which is contained in the stereotyped phrase of his monthly reports to the Registrar-General, as to the presence of living organisms in the London water, except perhaps that in the one case the creature is rare and microscopic, and in the other abundant and easily seen. Of a truth, we may sometimes strain at a gnat, when we can easily swallow a camel. To quote from Mr. Homersham, the civil engineer (*Report of Royal Com.*, 6286), concerning the water supply of Manchester, it would seem that these illustrious strangers, upon whom the municipal authorities have conferred the freedom of the city, are at all times discoverable in the city water. "If," he says, "you take a globular vessel, such as the globes in which gold and silver fish are kept, and which assists in magnifying the insects, you can see them jumping about in all directions." Imagine what would be the state of the public mind in this metropolis if such a condition of things existed. Nor are they alone repulsive to the senses, for occasionally they may be hurtful to the system. An example of this is "adduced by Moleschott, a writer on dietetics of the highest eminence, who states that the frequent diarrhœas produced by the still running river waters of the Netherlands, among which he specially mentions the Maas, are commonly attributed to the organisms they contain."

In the second place it is contended that carbonate of lime in water is necessary for the formation of bony tissues. "It is trite to tell that the bones form the framework of the animal structure, without the existence of which, in due hardness and solidity, it could have neither strength, proportion, nor uses. It is almost alike familiar, that more than a half of the substance of the bones, conferring upon them this necessary stability, consists of earthy salts, of which phosphate of lime constitutes the larger portion; the bulk of the remainder, and still a very considerable portion, being carbonate of lime. But it is not a fact so generally or so easily cognoscible, that, according to many proofs and observations advanced, especially by Valentin, a highly distinguished physiologist, the phosphate of lime itself is frequently first formed within the body, being derived from the lime which has been introduced as carbonate of lime, and which joins itself to phosphoric acid set free from other combinations. In newly-formed bones, besides, and in the fresh junctions of fractured bones, he found the relative proportion of the carbonate of lime to the phosphate greatly increased, affording another proof of the essential importance of the existence of the carbonate within the body; while Fletscher and Beneke, in confirmation, have remarked the more rapid union of fractures under its use. Analogous observations have been made by Seegen. By an opposite set of proofs, Boussingault, Chossat, and Seegen have shown the injury to the solidity of the bones, in instances where carbonate of lime has been incidentally or designedly withheld. In the disease of rickets in children also, a well-known scourge in dense populations, there is an interruption in the process of ossification, the proportion of earthy salts in the bones being sometimes reduced by two-thirds; and it must here be manifest how much further damage may be effected in increasing the number, or in aggravating the affliction, of the puny and distorted victims of the disease, by an arbitrary abstraction of the supply of the carbonate of lime provided by nature. Scrofulous diseases, moreover, so wide in their range, and so destructive in their direct as well as indirect influence, owe much to the moderate and habitual use of lime for their prevention, as at one time, before the discovery of iodine, they depended extensively upon it for their cure. Taken from our drinking waters, besides, lime takes along with it their freshness and sapidity, and leaves them destitute of a stimulus to the stomach and its functions more truly efficient, and in the end more wholesome, than the most relished of condiments. And it is precisely through our best, and in all ages most esteemed, class of drinking waters that this salutary agent is, though existing in other articles of aliment, presented to us the most regularly, the most habitually, under the most varied forms of diet, and in that state of solution the most adapted for its reception and assimilation within the system. But even if water could be proved to afford only the half of our supply of this wholesome agency, necessary and advantageous at all times, and in the periods of growth a special mainstay—and if reckless or sanguine minds were bold enough to assume, what, to say the least, has never yet, either in proper extent or adequate duration of time, been anywhere even duly tested, and were to maintain that the part to be procured from other sources was sufficient for all our wants—would it be wise in us, on such grounds, so laxly established, to reject the half of the wealth offered us by nature, that we might make the experiment of subsisting on the remainder?" I have elsewhere observed, in my published lectures "On Food," that four-fifths of the earth's surface are composed of calcareous strata which yield water that is more or less rich in carbonate and sulphate of lime; and it may be that this is a wise provision for the supply of these salts to the animal system. As the late Mr. Johnston truly observed, in his "Chemistry of Common Life," "the bright sparkling hard waters which gush out in frequent springs from our chalk and other limestone rocks are relished to drink, not merely because they are grateful to the eye, but because there is something exhilarating in the excess of carbonic acid they contain and give off as they pass through the warm mouth and throat, and because the lime they hold in solution removes acid matters from the stomach, and thus acts as a grateful medicine to the system. To abandon the use of such a water, and to drink daily in its stead one entirely free from mineral matter, so far from improving the health, may injure it;" in fact, the water of a country may determine the diet of its inhabitants. The soft waters of the lakes of Scotland, for example, may have had something to do with the choice of brown meal; and but for the calcareous waters of Ireland, the potato could not have become a national food. "The criterion, therefore, of the wholesomeness of a water, depends, not merely on facts and observations of scientific exactness, but on the demonstration of a general sense of fitness and probability which has attracted to it the spontaneous assent of the world in all ages, with a degree of unanimity that has remained unbroken till very recent times, and even yet in singularly few examples. Of the higher kind of assent, that of physicians and chemists of eminence, including those who have made the subject of the preservation of health a peculiar study, I could offer almost countless further instances; and proceed to add a few, selecting from among only the more recent, and naming none unless of high merit and distinction, as well as of special authority on the question. Johnston, speaking in his 'Agricultural Chemistry' of the presence of earthy salts in water, says that 'it is not without a purpose that all water we meet with is thus impure. The fluids of the animal body contain nearly the same saline substances as are present in the water we drink, and from this source it is no doubt intended that a certain portion of those saline substances should be obtained upon which the preservation and health of our bodies depend.' 'Thus there is an obvious design and adaptation in the impurity of our spring and river waters, for *by that impurity they are better fitted to minister to the wants of living beings.*' (The *italics* are in the original.) 'We see,' remarks Boussingault, in his 'Memoirs on Agricultural Chemistry and Physiology,' 'by what precedes, that the saline substances dissolved in water have their place in alimentation, which, without their assistance, would have been insufficient.' Dupasquier points out the usefulness of bicarbonate of lime in potable water; urging that 'the quality of potable waters stands in no relation with their degree of purity; that the purest waters, with regard to the quantity of matters dissolved, are not on that account the best; and that it is by a truly providential provision of nature that waters contain more or less of foreign matters in solution.' Riche, Professor at the School of Pharmacy at Paris, says, in a recent lecture, that spring water is the best of all waters; and for this he adds to his own authority that of the eminent chemist, Dumas. He notifies, further, that carbonate of lime, if in small proportion, gives an agreeable taste, and is salubrious; and that it is by carbonic acid that the lime necessary for our organism is dissolved, by which water is converted into a veritable aliment. Tardieu, the great authority on public health in France, states that most writers hold the presence of one part of carbonate of lime in two thousand of water as advantageous. Oesterlen, who is to Germany, in many respects, what Tardieu is to France, says that a chemically pure water is by no means the pleasantest water to drink; that the sparkling clearness, and agreable and refreshing quali-

ties to be desired, depend much on moderate impregnation with salts of lime; and that these salts of lime, so presented to us, are required for our bones and other tissues. In a report made to the Academy of Medicine in Paris, by MM. Poggiale, Boudet, and Tardieu, and adopted by that distinguished body, it is remarked that all communities seek spring water, even at great sacrifices of cost; and, among others, nine principal places of France are specified, with some foreign examples, as Rome, Brussels, and Edinburgh. They point out as an error to be combated, that the chemically purest waters are the best; the saline matters being necessary to the support of life, becoming absorbed like alimentary substances, forming thus part of our organization, and requiring renewal like its other portions. Lefort considers that a drinking water should contain enough of mineral salts to contribute to the process of ossification; and he has the further statement, that a water which holds dissolved the greatest possible proportion of carbonic acid, oxygen, and nitrogen, and which contains carbonate of lime in quantity below that which curdles soap, leaves nothing to be desired, whether for drinking or for household economy. Professor Bouchardat recognizes the usefulness of carbonate of lime in waters for a variety of services to the living system, and amongst these for aiding the nutrition of the young, by supplying an indispensable aliment to the bones; and it is on this ground that he considers rain water too pure, the absence of the salts of lime being prejudicial to 'nurses, children in early life, and young animals.' Huguenv sets the chief value on the existence of lime in waters, from its being required in the period of man's growth; and Agassiz, to possess whom amongst them is a pride to the Americans, has remarked that the drinking of water in limestone regions enlarges the skeleton. And let it be remembered, as another important element for consideration in the choice of a drinking water, that it has been found that the original temperature of a source becomes little affected by transmission through even covered conduits. Many observations of this have been made abroad; and, among others, by MM. Commaille and Lambert at Rome, who have ascertained that the waters from springs, which supply that city so profusely, are uniformly fresh and cool in summer as in winter; while the water brought to supply a fountain from the lakes Bracciano and Martignano, though it arrives in such mass as to drive mills, is variable in temperature, warm in summer and cold in winter. Thus the *aqua virgo*, esteemed the best in Rome, arising from springs, and flowing underground in an ancient conduit, was found to show a heat of 57° F.; while the more modern supply from the lakes, introduced in the 17th century by Pope Paul V., and flowing also through a subterranean conduit, both being of considerable length, stood as high as 73° F., the temperature of the air at the hour of the experiment being about a degree lower. In a word, it was unfit to refresh or quench thirst. If the authorities here quoted are chiefly foreign, it is because the subject has been infinitely more and better considered in foreign countries than in our own."

But it may be asked whether all the authorities are thus on one side, and whether there be no conflicting testimony to adduce, and which assuredly ought not to be concealed. It is merely the truth, however, to state that such testimony occurs only with extreme rarity, is presented by far less eminent authorities, and occurs with an incompleteness, and often with an inaccuracy, that tallies with the difficulties that were to be encountered where the probabilities it had to contend against were so strong and so manifold. "Thus," says the physician, "I have seen it stated that the Dutch drink waters destitute of carbonate of lime, and yet are a healthy and robust people. But my knowledge of Dutch medical literature is neither so indirect nor so scanty as not to have made me aware how far such a statement is from being supported by the facts. A journal, under the leading editorship of the singularly able Professor Donders, of Utrecht, speaks of the 'duinwater,' with which Amsterdam is chiefly supplied, as containing more than double the quantity of carbonate of lime (no less than 11½ grains to the gallon) than is dissolved in the 'schuitwater,' a source of supply which has been partially introduced; and assigns this as one of the qualities which confer upon the former a decided superiority as a drinking water. A writer in another Dutch medical journal speaks of a well at Amsterdam, the water of which contains even a larger proportion of carbonate of lime, on the score of which he claims for it a decided preference over rain and river water; and he remarks that no instructed person can dispute the great value of a certain proportion of this substance in drinking waters for the uses of the organization. In a paper read before the Academy of Sciences at Amsterdam, the wells at Utrecht, The Hague, Middelburg, Leyden, Zwolle, and Bois-le-Duc, are severally instanced as containing very considerable portions of carbonate of lime. And so this alleged fact falls to the ground. Another instance which has been cited is that of Aberdeen. But who shall say, after the facts and opinions which will be adduced, that there is no relation between the inferior quality of the water at Aberdeen and the appreciably higher mortality there than in Edinburgh, as shown, in the mean of ten years terminating in 1866, by the returns of the Registrar-General—Aberdeen having a far less numerous and less dense population?" Referring to the evidence of Dr. Angus Smith (report of Royal Commission, 7261), that in his opinion the tallest people in Great Britain are to be met with in soft water districts—for instance, in Cumberland, and probably in Aberdeen—the physician says "that as this is evidently only a surmise, derived from no actual investigation, he might be content to meet it with a retort founded at least upon something better than surmise." "It has," he says, "always been impressed on me as a fact, which has been confirmed to me by a late friend and patient, who was for long surgeon to the Life Guards, and still more recently by an intelligent non-commissioned officer, retired from the same body, that its best and tallest recruits, or, in other words, the finest men in the realm, were obtained from the border districts of England and Scotland, descending southwards through a considerable part of Yorkshire. But, fortunately, there is no need of making this altogether a matter of surmise, or of conjecture on imperfect evidence, in any form. Every district may not be imbued with equal military ardour, nor may it always be a safe criterion to judge of the mass of a population from a gleaning of its more remarkable examples. It is only possible to arrive at a proper estimate by taking promiscuously the population as it presents itself; and this has been recently done in a wide series of measurements, taken in all parts of the country, by Dr. Beddoe, with the aid of many coadjutors, and recorded by him in the last published volume of the Memoirs of the Anthropological Society, making us indebted to him for by far the completest and most authentic document of the kind that has been hitherto published. From it we learn that, in Scotland, the Borderers in general (p. 542) equal or surpass the average of the country both in height and weight; while the Borderers of the English side have a still more unequivocal superiority over their own countrymen. These men live, not on the granite or gneiss, nor the slates, giving origin to soft water, but over the lime of the coal formation, with the shales, and marls, and magnesian limestones of the sandstone formations; and the waters they drink are hard, those of Berwickshire and Roxburghshire thickly incrusting the housewives kettles. Over the abundant limestones of Yorkshire the men are among the tallest in England, and Dr. Beddoe specially instances here the inhabitants around Richmond and in Swaledale. The average for Berwickshire is actually 1½ inch above that of Aberdeen; while as to Cumberland, Dr. Beddoe gives to it, excluding Carlisle, an average of 1 inch below Berwickshire, and ½ inch above Aberdeen. This result seems naturally explained, if we consider that the level parts of that county are of the new red sandstone formation, or the coal formation, and that a broad belt of limestone surrounds the mass of slaty hills in the interior, so that the greater portion of the population lives beyond the soft-water limits. 'In the old red sandstone district,' says Professor Ramsay, in his Lectures on Physical Geology, 'where the marls are somewhat calcareous and interstratified with impure concretionary limestone, called cornstone, the waters are hard. Again, the waters which flow from the Pennine chain, that extends from the southern borders of Scotland into Northumberland, are all hard, because they drain areas composed chiefly of the carboniferous limestone; and all the rivers that run east from this range, over the new red sandstone and lias, and the oolitic and cretaceous rocks, are of necessity exceedingly hard.' And such waters supply the homes of those shown by Dr. Beddoe to be generally the most stately and vigorous of our population. Thus Dr. Smith's statements, relied on by Dr. Frankland, appear only as the product of vague impressions, reached without special inquiry, and hazarded without comparison or consideration; and such have ever intruded themselves into science as its opprobrium, compelling it rather to engage itself with the wearying task of the extirpation of error than with the cheerful labour of the discovery and establishment of truth. But Dr. Angus Smith makes yet another statement, which Dr. Frankland does not quote, in the form of an assertion that the smallest number of deaths occurs in the western district of Scotland, where there is soft water; and which I now introduce here in order to controvert it also. Let us select two typical counties, Argyleshire and Berwickshire, each with thirty-one parishes; and we find from the returns of the Registrar-General that, on an average of the ten years ending in 1864, while Argyleshire had only eleven parishes with a mortality smaller than 15 in the thousand, Berwickshire had as many as 19, the two lowest rates in the former being 11·4 and 12·8, but in the latter only 5·6 and 7·4. Roxburghshire, too, out of the like number of parishes, shows the same proportion of 19 which have a death-rate under 15 per thousand.

"What is true of man, in this country, in relation to the connection between his vigour of growth and the existence of carbonate of lime in his drinking water, is true of him also in other countries, and is not less true with regard to the lower animals. To content ourselves with the most remarkable of all examples, we may refer to the Patagonian savages, still universally acknowledged, after the removal of somewhat of former exaggeration, to be the most gigantic race known, whose home is on the tertiary plains of their country; while their immediate neighbours to the west, living among the extreme hills of the range of the Andes, are of far less stature, but still greater savages. Reference has already been made to the testimony of Agassiz on this point of stature, as well as to the conclusions regarding it arrived at by the Ministerial Commissions of France and Austria. M. Durand de Gros, quoted by Dr. Beddoe, has lately, in an important paper on the influence of mediums in the Aveyron, claimed a higher stature for the natives, human as well as bovine, of the calcareous districts in that department. As to cattle in this country, it will be remembered that all our finest breeds have originated in the hard-water tracts of the shires of Lincoln, Leicester, York, Durham, and Northumberland; and that these breeds have been everywhere largely used to improve the races in other districts, and must still be frequently reverted to by the latter for the maintenance of what are only acquired, rather than inherent, excellences. The same may be said of our sheep, all our best flocks being indebted for many of their highest qualities to the breed of Leicesters, reared on the lias, with its marl and limestones, and the sandstones of their native country. And so again of our horses, whose best and stateliest forms are developed among the carboniferous limestones of Lower Clydesdale, of Northumberland, and of Yorkshire, or, if we look abroad, upon the tertiary strata of Holstein and Flanders; while among the gneiss of Shetland and the Grampians, and the slates of Wales and Cumberland, we have the diminutive Welsh and Highland sheep and the Herdwicks, the kylo, and the pony, as the characteristic indigenous races."

And now to another point:—

"The epithet of purity, with regard to water, is one that has been grossly misapplied. Apart from chemistry, and with reference to its salubrious uses, a water is no more entitled to be termed pure because it is destitute of a moderate impregnation of earthy salts, than a beer is pure in the proportion that it is little imbued with the extract of malt, or a soup with animal juices. Its purity consists in its commensurate endowment with those properties that fit it for promoting the growth and sustaining the functions of the living system. Were our aims for a community to be lowered from the consideration of how we might raise to the highest perfection its health and its vigour, and so conduce to its happiness and well-being, to that of how we best might aid it in economizing its soap, then the application of the term purity to a water unimpregnated with earthy salts would conceal under it less of a mischievous fallacy. But, even here, what is wholly true, in a chemical sense, of the effect of the hardness of water in decomposing soap, is only partially true in a practical application." "Where neither the observing nor logical faculty has ever necessarily been specially or habitually exercised, men's minds see only that which lies most prominently before them, and deciding upon it, ignore the rest, because it does not lie within the sphere of their inquiry, and because of the difficulty they have in penetrating to the principal quality when it is not the most apparent. Thus on purity, in this matter, as bearing on soap, they have a glimmer of light; but on purity, as affecting the laws of life and organization, which they have made no object of study, they are absolutely in the dark."

The Royal Commissioners, in their report on water supply, have made a special reference to the misapplication and abuse of the term impurity as applied to the solid constituents of water; for they say we cannot "agree with some eminent authorities in looking at river water solely from a chemical point of view, and speaking of the presence of 10 or 20 grains of mineral matter in a gallon of water as *impurities*. So, chemically speaking, they are, but as this seems to be almost a normal condition of river waters, we should not be disposed to consider this term an appropriate one to be applied to substances so constantly present in natural springs and streams. And further, we cannot but consider it unphilosophical, when, in addition to treating as 'impurities,' substances perfectly harmless even in much larger quantities, the minute quantities present in a gallon, or any other small measure of water, are multiplied by taking large masses of water, such as the individual never has to deal with, and given to the public in figures so large as to tend to cause misconception, and perhaps unnecessary alarm in the minds of those not conversant with all the conditions of the case. It would be as just to speak of the small proportion of carbonic acid present in the atmosphere, equally in populous cities and in the Alps, as an impurity, and to startle those unacquainted with the subject by giving in some large figures the total quantity of that gas present in the atmosphere of London."

As you are aware, the conclusion of the Royal Commission on water supply was that hard water, like that of the Thames, is preferable to soft for the supply of London; and a like opinion in respect of Paris and Vienna was arrived at by the *savans* appointed to investigate the subject of the water supply to those cities. But in reply to this, says the physician, "Dr. Frankland adventures the statement that, 'in respect of that section of sanitary science which is devoted to town drainage and water supply, our continental brethren are at least a quarter of a century behind us.' This was said with the evident intention of depreciating a part of the eminent authorities already quoted; and yet what is it but merely a repetition of the old fallacy that asserts what is the truth of one thing which has not been denied, and is not even in question, in order to have it accepted by minds little practised in logic as true of another thing which is denied, and is the real matter at issue? It is this setting of a partial and non-essential truth in the place of the main and vital truth that most easily misleads the undisciplined reasoner, and thus forms the pest of controversy. No one has disputed that, in the actual practical details of what may be termed municipal and domestic hydraulics, in as far as the mere distribution of water is concerned, the mechanism employed by us, as well in extent as in quality, is generally superior, not to what is known among men of science, but to what has been commonly adopted among the habits of life of the Continent. But, for anything beyond this, to assume a superiority for this country seems to me the most unwarranted of pretences. When we turn to the whole broad science of hydrology,

having for its object the study of the qualities of water, whether fresh or sea, pure or mineralized, including the nature and variety of its constituents, with their physiological and sanatory, as well as sanitary, properties and action, while our own home literature is either an utter void, or shows little beyond a few treatises of neither repute nor originality, we find that of the Continent rich with an array of special and general disquisitions; and these proceeding for the most part from men who, with the basis of an ordinary medical education, have received a direct appointment from Government to superintend and officiate at the various watering-places, and who have thus been constrained to make the subject of water, with its actions on the human frame, and those of its various modes of impregnation, the peculiar study of their lives. Let any one refer to a work so well known among the better educated of medical men as Plouequet's 'Digest of Medical Literature,' and let him run his eye down the long columns containing the catalogue of dissertations on the topic of water, in all its forms and varieties, published up to a little beyond the close of the last century, and he will soon discern how very minute is the proportion among these of the works of British authors. Nor has this proportion changed since. We have no names to place in rivalry, just or unjust, with those of Osann, Helfft. Simon, Ewich, Vetter, James, Posner, Seegen, Durand-Fardel, Lersch, Graefe, Kalisch, Spengler, and many others, besides those I have formerly quoted, all very recent or still living authors.

"Doubtless there have been fluctuations of opinion; for a credulity that believes anything, and a scepticism that tests everything, have been ever the bane and the antidote in scientific progress, the fate of which is still to advance among the ruins of temporary reputations, though the actual state of our knowledge on this topic of water is best evinced by the recent decisions of the Government commissions of the three chief centres of European civilization, who have obviously possessed, and have fully used, the best means of gathering proofs and eliciting or eliminating opinions. It is, besides, characteristic of the zeal with which the study of this subject is pursued abroad, that there are at least four periodicals specially devoted there to its investigation, while in this country it would be a futile attempt to produce one."

But the most remarkable fact for consideration is the comparatively high mortality in towns supplied with soft water, the mortality being almost in the direct proportion of softness. This has been ably discussed by the physician, who says:—

"In the appendix to the report of the Royal Commission there is to be found (p. 77) a table, presented by Drs. Letheby and Odling and Professor Abel, from which much weighty instruction is to be derived. Its design is to show the relation between the quality of water, more especially as to its degrees of hardness per gallon, and the prevalent rates of mortality in 27 cities and towns, 24 of which are in England, and three in Scotland; but as the towns are grouped in only two divisions, according as the waters are above or below 10° of hardness, and as the mortality seems to be founded on that of only a single year, I have thought it better, for the sake of greater security, to re-cast and add to the materials, founding the rates of mortality, with a very few exceptions, on the average of ten years, while increasing by 38 the number of the towns and cities, five of them being in Scotland. The 65 towns thus collated I now place under four several categories as to their degress of hardness; the first group embracing those above 10°; the second, those of from 10° to 6°; the third, those of from 6° to 2°; and the fourth, those of 2° and under. Within the first group are embraced 25 towns, among which is London, their average population being above 230,000, and the mean hardness of the waters 16·0° per gallon. In the second group 17 towns are included, having an average population of above 137,000, and an average hardness of 8·0° per gallon. In the third group there are 15 towns, the average population being above 120,000, and the hardness 3·8°; while in the fourth group the towns are 8 in number, the average population amounting to above 88,000, and the hardness to 1·3° per gallon. In all statistical inquiries, we know that we approach the nearer the truth the more carefully arranged are our categories, and the more widely they are based on extent of numbers and time, and we have here enough to reach a tolerably safe approximation. The facts elicited are striking and important."

(To be continued.)

NOTES ON PHOTOMETRY.

By William Foster.

One of the Gas Examiners to the Metropolitan Board of Works.

It occasionally happens that three or four experiments made at regular intervals during two hours of any one evening agree so closely that the gas appears to be of the same value each time an experiment is made. The very reverse, however, sometimes occurs, the numbers representing the illuminating power of the gas during the evening differing to the extent of two candles. The readiest explanation of such results as the latter is, that gas of varying quality has been passing through the main at different periods of the evening; and such a view of the case appears to be the only feasible one, when the experiments are known to have been made under similar conditions. By similar conditions it is implied that the gas has the same temperatnre, and is passing through the meter at a uniform rate, the barometer stationary, and the candles burning the same amount of sperm, or about the same, in each experiment. The first three conditions are obviously necessary. The latter does not at first sight appear to be so, owing to the correction made at the end of each experiment for any variability in the rate of consumption of the sperm. For most practical purposes, this correction for different rates of consumption of the sperm is sufficient—that is, when the candles are burning about the standard quantity. Still it is desirable to restrict its application within as narrow a limit as possible. The instructions of the gas referees are, that each experiment shall occupy ten minutes, and that the two candles employed shall consume 40 grains of sperm (120 grains per hour). These conditions are rarely if ever fulfilled; and it is to wide variations from this standard that my remarks are especially applicable. I have long ago questioned the value of observations taken with candles burning at low rates—say from 33 to 35 grains, and sometimes have not recorded them. The method adopted for arriving at a corrected result is to multiply the sum of the ten photometrical readings taken during the ten minutes by the number of grains of sperm consumed, and to divide this product by two, since two candles are used in the experiment. This process involves the theory that the light emitted from sperm is in simple proportion to the quantity consumed. For instance, *cæteris paribus*, the photometrical readings, based on the law that the intensity of lights is in the proportion of the squares of their distances from the point of measurement, are inversely as the consumption of the sperm. In other words, that any deficiency in the amount of sperm consumed is compensated by a higher reading in the photometer, and *vice versâ*, so that the product obtained by the multiplication of the readings and the quantity of sperm consumed fairly represents the quality of the gas. This does not appear to me to be exactly true, at least not so far as ordinary practice is concerned. During last winter I had a parcel of candles, many of which gave not only low rates of consumption, but also very variable ones. Some of my results at that time were very high; and since then I have incidentally noticed that a low rate of consumption of sperm is in the majority of cases attended with a high number representing the illuminating power of the gas. In order to speak with confidence on this point, a large number of experiments have been made, the majority of which bear out all that I had previously noticed. They were made on consecutive evenings, extending over a week, and one experiment followed the other as quickly as circumstances would permit, the object being to notice whether any difference in the quality of the gas could be detected in such short intervals, when the conditions of the experiment were the same. The following were taken on three succeeding evenings, the same pair of candles being used for all the experiments made on any one evening. The method pursued was slightly different from that recommended by the referees, and was as follows:—

During the time that the candles were burning in order to be ready for the first experiment, the quantity of gas was adjusted by the meter clock, the meter clock being used only for that purpose. Having the candles burning at the required rate, they were then placed on a balance, and, when the turning-point was reached, a clock was immediately started by the right hand. A 40-grain weight was then placed in the balance on the side of the candles, the whole removed to the photometer, and the observations taken in the prescribed time. Towards the end of the 10 minutes the candles were taken out of the photometer, placed on the balance, and the moment that the turning-point was again reached, the clock on the right was instantly stopped. The time which had been required to consume 40 grains of sperm was then noted, and from this was calculated the consumption in 10 minutes. Thus, suppose 625 seconds have been required to burn 40 grains of sperm, then $625 : 40 :: 600 : x : x =$ the consumption of sperm in 600 seconds (10 minutes), in grains. This method in theory is the true one, the object being to weigh the candles on the two occasions under the same conditions so far as currents are concerned. Apart from this consideration, it has two special recommendations; there is no danger of losing any particles as there is when the candles are blown out, and in the second place the candles are immediately ready for another experiment. The experiments here given were made at a time when the pressure in the main was extremely regular, so much so that, having once obtained the gas passing at the required rate, scarcely any further adjustment was necessary.

July 6, 1871.

Time when an Experiment was commenced.	Sperm Consumed in 10 Minutes.	Illuminating Power in Candles.
8.25 p.m.	40·0	16·16
8.40 „	40·0	16·26
8.55 „	40·9	16·38
9.5 „	36·6	17·00
9.30 „	37·3	17·28
9.50 „	42·1	15·45

July 7, 1871.

8.25 p.m.	36·6	17·00
8.50 „	42·9	14·69
9.40 „	36·7	16·90
9.55 „	37·3	15·85

July 8, 1871.

8.30 p.m.	37·4	16·79
8.50 „	36·1	17·03
9.7 „	44·8	15·90
9.20 „	37·5	16·81
9.35 „	40·8	16·07
9.50 „	40·0	16·68

Experiments are not wanting which, at first sight, would appear to upset what these now given are intended to show; but such are not numerous. Besides, it must be borne in mind that throughout the whole there was the possibility of a difference in the quality of the gas. Hence the necessity of making a large number of experiments before any satisfactory conclusion could be arrived at. These results may be objected to on the ground that the use of the same candles for showing the effect of different rates of consumption is faulty at the outset, simply because the wicks are not adapted for such varying quantities. I may add that my experience is, that candles will of themselves vary to the extent of several grains. The candles here used were trimmed in order to obtain the different rates, but in no case could I detect anything objectionable in the character of the flame—they did not smoke. These results practically show that the tendency is to report gas above the truth when the rates of consumption are low; or that the amount of light emitted by sperm when burnt in the ordinary way is not simply proportional to the amount consumed, but that it is proportional *plus* a certain quantity. I regret that I have not the means of storing gas of uniform quality, so as to be able by further experiments to arrive at some satisfactory numbers showing the law which regulates this increment to the illuminating power.

The photometer used is that known as Evans's improved form of the Bunsen. It is a rectangular box, 112 inches long, 6·5 inches broad, and about 11·5 inches high. The whole of the interior is lined with black velvet, except the greater portion of the roof, which is rounded, and made of blackened sheet copper. Midway in this box is a fixed diaphragm containing the waxed disc. The box is thus divided into two chambers of equal size, the capacity of one of them being about 4200 cubic inches. In one of these chambers, 50 inches distant from the waxed disc, is a fixed burner for the gas to be tested. In the other box is a sliding support for the candles, this support carrying an indicator which moves along a graduated scale on the outside of the machine. Each chamber is provided with a large door at the side. When an experiment is being conducted, the two chambers are closed during the entire time. The 40 grains of sperm burnt in 10 minutes require 126·2 grains of oxygen from external sources in order to convert the carbon and hydrogen into carbonic acid (carbonic anhydride) and water. The amount of atmospheric air containing this quantity of oxygen is 1768 cubic inches, or nearly one-half the amount contained by the chamber in which the candles are placed. In addition to this a large quantity of air is always carried along with the spent vapours, by virtue of the current which they establish. Now what are the precautions taken for the supply of air, and the exit of the products of combustion and rarefied atmospheric air? Along the whole length of the under part of the machine is a narrow slit from 3-16ths to 4-16ths of an inch in breadth. Air cannot pass into the photometer through this slit without passing twice at right angles, thus avoiding all danger from draughts. This source of air is the only intentional one, and I imagine is sufficient to meet the requirements of both the gas and the candles. It is the means of exit of the heated vapours that appear to me to be faulty. Every one accustomed to the use of the instrument must have noticed that nearly every time an experiment is made the numerical value of the photometrical readings gradually increases. This increase is such that where the first reading may be 8 the probability is that the 10th will be 9, or 9·5. This ought not to be, as it indicates that the candles do not give the same amount of light towards the end of an experiment that they do at the commencement. It is quite manifest that the gas does not suffer, at least not to the same extent, as the candles, otherwise the increasing value of the readings would not occur. My opinion is that the gas is tested under more uniform conditions than the candles, and for this reason: Immediately above the Argand burner is a copper chimney, which at once takes away the heated gases and rarefied air, causing a proportionate influx of cold air through the slit below. The chamber containing the candles is also provided with a similar chimney, equally distant from the waxed disc—namely, 50 inches. The two chimneys, placed as described, not only maintain the symmetrical proportions of the instrument, but, if required, also permit two kinds of gas to be tested in it by burning one at each end. In addition to the two chimneys, one in each chamber, the eaves—so to speak—of the arched copper roof along their entire length admit of the exit of the heated vapours. The two slits, one on each side, are more complicated than the one at the bottom which supplies the air, and consequently the products of combustion of the candles have to pass by a very circuitous route before they can escape. There can be no question that the chimney placed above the gas-flame permits all the impurities to escape at once. The case of the candles is different.

When testing 16-candle gas the two candles are then more than 30 inches distant from the chimney, so that its use for the purpose of ventilation is *nil*, or nearly so. The spent vapours and heated air must then escape promiscuously through the slits along the two edges of the roof, which appear to be insufficient for the purpose. At first I was led to suppose that the increased value of the readings was due to an imperfect supply of atmospheric oxygen, owing to the narrowness of the slit supplying the air. But such a view is no longer tenable when one reflects that the supply to a flame eight times the size takes place through the same sized opening, without any apparent deterioration in the value of the flame. And yet there can be no doubt that it is owing to an imperfect supply of oxygen, although caused somewhat differently. The ingress of air is determined by the egress of the heated vapours, so that increasing opportunities of escape for the latter is simply causing a greater supply of the former. It therefore appears to me highly desirable that some form of chimney should be placed over the burning candles, so that they may be under conditions similar to those under which the gas is being tested in the adjoining chamber. If this chimney were constructed with a moveable diaphragm, the draught would then be under control. As the instrument is at present worked, the candles are so near the roof that the need of this addition is shown by its very high temperature after the candles have been under it not more than 10 minutes.—*Chemical News.*

Dr. Stevenson's Report on the Gas supplied by the Imperial Gas Company during the Month of August, 1871.—During the month of August the average illuminating power of the gas was 14·2 standard sperm candles, the maximum being 14·5, and the minimum 13·2 candles. A minimum of 14 candles is required by the new Act. The examinations are made according to the old Act, in order that a more accurate comparison may be made as to the supply under the old and under the new Acts respectively. If the testings were made according to the instructions of the gas referees under the new Act, the illuminating power of the gas during August would be seen to be apparently raised, and the minimum illuminating power would be found to have invariably exceeded the statutory minimum. The illuminating power during August was a little lower than is usual. Ammonia was detected on every occasion of examination exceed one. Sulphuretted hydrogen was never detected. Sulphur, in all its forms, was present to the amount of 21·22 grains per 100 cubic feet. This is about the usual amount.

Gas Explosion.—On Thursday an explosion happened in the private residence of Mr. M. Godfrey, No. 31, New King's Road, Chelsea. It was caused by a fitter named Walday taking a light to search for an escape of gas. The explosion shattered the windows, broke down the doors, set in flames the blinds and window curtains, and completely encircled Walday in fire. The engines were sent for, but the fire was extinguished by the neighbours in the interval. The damage done to the premises was very serious, and Walday was fearfully burned about the face, neck, and right arm.

The Sewage Question at Cambridge.—Various reports having from time to time appeared relative to the question of diverting the sewage of the town from the river, we are in a position to state that many of the reports are inaccurate, and all of them decidedly premature. The subject is under the consideration of a joint committee of the Cambridge Improvement Commissioners, the town council, and a Syndicate of the University. Nothing at present has been decided upon, and as yet it is wholly uncertain what steps will be take in the matter. A meeting of the committee was held yesterday afternoon, when they condemned the inaccurate rumours which had been circulated.

New Reservoir at Kidderminster.—The water reservoir at Kidderminster, the construction of which was commenced last October, has just been finished. It occupies an elevated position on Mr. Boraston's farm, called "One-Tree Hill." Its internal dimensions are 200 feet square, and about 12 feet deep. When filled, it will hold about 3,000,000 gallons. Great care has been taken in the construction. About 6 feet were at first excavated, a thick bed of concrete then laid, and about 2 feet of puddle-work upon that. The earth was thrown up all round, and forms an esplanade of about 10 feet wide. The whole cost of the structure is about £3000. The sides are of brick, backed by 2 feet of puddle and a wall of stone. Mr. J. F. Fairbank, C.E. pronounces it to be the best-built work of the kind in the kingdom. There is no doubt that the water supply will be satisfactory, as the reservoir stands as high as the gilt ball on the old church. The boring for water is not yet completed, and, although steam power is being employed, the progress made is slow, as some hard basaltic rock has to be pierced. The mains are, however, being laid down in the streets of the borough, and every preparation is being made to take immediate advantage of the water supply as soon as it is available.

The Batley New Water-Works.—On Tuesday, Mr. S. Tubb, the Mayor of Batley, cut the first sod of the new Batley Water-Works, which are to be constructed at Yateholme, a little distance from the village of Holme, several miles beyond Holmfirth. Batley, which has a population of 20,000, has hitherto been supplied from the reservoir at Dunford Bridge, but as the town has increased in size, the corporation went to Parliament for powers to acquire land in the Holme Valley, or more properly speaking the Ramsden Valley, in order to construct a new series of reservoirs to secure to the town an adequate supply of water. After the first sod had been cut on Tuesday, Mr. Bateman, C.E., who has been engaged to supervise the works, made a statement to the effect that the first of the series of reservoirs will be capable of holding 33,000,000 cubic feet of water; that it will have an embankment containing 300,000 cubic yards, and that at the deepest part it will be 40 feet high. The four reservoirs, when completed, will give Batley a daily supply of 2,000,000 gallons. The whole cost of undertaking will be about £200,000. The second reservoir will be the Riding Wood reservoir, and when the two are completed two-fifths of the work will have been accomplished, and 1,000,000 gallons of water per day will have been secured to Batley. The length of pipes will be 18 miles, and they will pass through Huddersfield.

Workmen's Treat—Ipswich Gas-Works.—On Thursday, the 17th ult., the whole of the stokers, lamplighters, mechanics, and labourers employed at these works, with their wives, were, by the liberality of the directors, afforded a day of thorough enjoyment at Harwich. The entire company went down by the 8.30 a.m. boat, and after a slight luncheon wandered about till 1.30 p.m., when they sat down in a spacious tent, erected on the green by Messrs. Rands and Jeckell, to a sumptuous dinner, well served up by Mr. R. Cocks, and to which full justice was done. The chair was taken by E. Goddard, Esq., who, after dinner, gave the toasts of "The Queen," and "Prosperity to the Ipswich Gas-light Company." Mr. J. F. Alexander proposed "Our hearty thanks to the directors for their kindness," and Mr. M'Coy gave "The health of the manager, Mr. Goddard," all of which were received with unmistakeable satisfaction. The company then adjourned to the green for singing and dancing to the strains of the gas-works band; and after tea in the tent, all returned home by the 7 p.m. boat, highly delighted with the day's proceedings. The perfectness of the arrangements made, both at Harwich for the entertainment of the party, and at Ipswich for carrying on the necessary work in their absence, reflected credit on all concerned, and undoubtedly increased the cordiality of the relations between employed and employers.

The Shale and Paraffin Oil Trade.—This trade is in a prosperous condition, and in respect of machinery for the purposes of this manufacture some extensive orders are at present being executed in Glasgow. In a recent number of the *Oil Trade Review* notice was taken of the discovery of apparently inexhaustible mines of coal and shale in Kharloff and Taganrog, in Russia. We have authority for stating that a very large order, from a company there, has just come by telegraph to Messrs. Geo. Bennie and Co., whose devotion to this department of engineering continues to be rewarded with a large business. They have now the contract for the erection of very extensive mineral oil works at Riazan, in Russia. Some samples of oleflant coal were sent from that quarter to this firm for analysis, and the experiments which they conducted educed the fact that the coal was of most excellent quality, and contained a large per centage of oil. The ubiquity of oil-bearing shale may be judged of by the fact that Messrs. Geo. Bennie and Co. have contracts in hand for refineries in Spain and Constantinople; and it is not long since they erected similar works in Italy, Bohemia, and other parts of the Continent.

New French Taxes on Matches and Schist Oils.—Our Chancellor of the Exchequer must look across the British Channel with much mortification. M. Thiers has succeeded in imposing a match-tax on France, with but little opposition. He has also imposed a heavy import duty on foreign petroleums, and more lately a tax on home-distilled schist oils. Instead, therefore, of a "little profit" from light, M. Thiers intends to extract much gain. The tax on chemical matches, defined as "all those primed or prepared to inflame or produce fire by friction, or any other means than direct contact with matter in combustion," is 1½ centimes for each packet or box of 50, and 3 centimes a hundred, or any fraction of a hundred beyond. This rate, however, only applies to the common sort, and to matches primed at one end. Those primed at both ends are considered two matches, and taxed accordingly. For matches *de luxe*, such as wax or German tinder, the tax will be 5 centimes for each packet of 50, and 10 centimes for a hundred, and every fraction of a hundred beyond. Such a tax will inevitably drive the poorer French people to resort to the old sulphur-tipped match, with the flint, steel, and tinder-box. Considering that France exports no matches, it is but poor consolation to the French manufacturer that exported matches will be entitled to a drawback. The tax will be raised in the way proposed by Mr. Lowe—that is, by requiring the boxes or packets to be surrounded with a stamp. M. Thiers is a fanatical Protectionist, and we are, therefore, much astonished at the imposition of a tax on home-distilled schist oils. It was opposed by some Protectionist manufacturers, on the ground that it would crush an industry still in its infancy. It would seem that the distillation of oil from native schist is only carried on in the neighbourhood of Autun, where a very poor mineral is found. But from the speech of the Minister of Finance we gather that the distillation of Boghead coal is carried on to some extent in the environs of Paris, and it is probably against this that the tax is directed. The duty imposed is but small, compared with that levied on foreign oils, being only 5 francs per 100 kilogrammes on the crude oil, and 8 francs per 100 kilogrammes on the refined; whereas the duty on American oils is 20, 30, or 40 francs per 100 kilogrammes, according to their quality, the lightest oils being the most heavily taxed.

Register of New Patents.

APPLICATIONS FOR LETTERS PATENT.

2381.—William Purdham Goulding, of 6, New Broad Street, in the City of London, for "*Improvements in packing for steam and other joints.*" Sept. 9, 1871.

2383.—John Fletcher, of 6, Bridgewater Street, Broughton Road, Salford, in the co. of Lancaster, engineer and packing manufacturer, for "*Improvements in packing-rings for steam-engine piston-rods, stuffing-boxes, pumps, and other similar purposes.*" Sept. 9, 1871.

2385.—James Livesey, of 9, Victoria Chambers, Westminster, in the co. of Middlesex, engineer, for "*Improvements in asphalte or similar composition, and in the application thereof to various useful purposes.*" Sept. 9, 1871.

2391.—Robert Johnson, of 6, Waterloo Place, Pall Mall, in the co. of Middlesex, for "*Improvements in asphalte paving.*" Sept. 11, 1871.

2393.—Alfred Vincent Newton, of 66, Chancery Lane, in the co. of Middlesex, mechanical draughtsman, for "*An improved mode of preventing the oxidation or corrosion of iron exposed to water or dampness.*" A communication. Sept. 11, 1871.

2402.—Henry Bunning, of Plough Wharf, Deptford, in the co. of Kent, manufacturer, and John Chapman, of Grosvenor House, Greenwich, in the co. of Kent, gentleman, for "*Improvements in the manufacture of compounds suitable for street and other pavements.*" Sept. 12, 1871.

2428.—William Henry Westo and Miguel Pinder, both of Walworth, in the co. of Surrey, for "*Improvements in or connected with overflow or waste-pipes for water-cisterns.*" Sept. 15, 1871.

2446.—David Bruce Peebles, of the Fountainbridge Works, Edinburgh, in the co. of Mid Lothian, N.B., engineer, for "*Improvements in gas-regulators.*" Sept. 16, 1871.

2451.—Alexander Melville Clark, of 53, Chancery Lane, in the co. of Middlesex, patent agent, for "*Improvements in cocks or valves.*" A communication. Sept. 16, 1871.

2462.—William Pawson, of Westgate, Grantham, in the co. of Lincoln, plumber, for "*Improvements in taps or valves for hot and cold water apparatus.*" Sept. 19, 1871.

GRANTS OF PROVISIONAL PROTECTION.

1411.—Alfred Tylor, of 2, Newgate Street, in the City of London, brass-founder, for "*Improvements in meters for measuring liquids and fluids.*" May 26, 1871.

2007.—Albert Marcius Silber, of Wood Street, Cheapside, in the City of London, merchant, and Frederick White, of Camberwell, in the co. of Surrey, watchmaker, for "*Improvements in apparatus for lighting purposes.*" July 31, 1871.

2157.—Thomas James Smith, of the firm of Robertson, Brooman, and Co., of 106, Fleet Street, in the City of London, patent agents, for "*Improvements in apparatus for lighting and extinguishing gas.*" A communication. Aug. 16, 1871.

2194.—John Robert Breach, of 4, Bridgewater Square, Barbican, in the City of London, agent, for "*Improved gas-fires.*" Aug. 21, 1871.

2233.—Francis Parry, of Piccadilly, in the co. of Middlesex, gentleman, for "*Improvements in apparatus for drying precipitated sewage and other like substances.*" Aug. 25, 1871.

2263.—William Webb, of 17, Evelyn Street, New Town, Deptford, in the co. of Kent, for "*Improvements in joints or connexions for uniting the ends of soft metal pipes to one another, and to other pipes and cocks and union-pieces.*" Aug. 28, 1871.

NOTICES TO PROCEED.

1210.—Henry Alexander Frederick Duckham, of Camden Town, in the co. of Middlesex, gas engineer, for "*Improvements in apparatus for controlling or regulating the supply of gas to burners.*" May 4, 1871.

1211.—Adolphe Pierre Vassard, of New Cross, in the co. of Kent, chemist, for "*Improvements in treating liquid sewage and other ammoniacal liquors in order to obtain manure therefrom.*" May 4, 1871.

1339.—William Edward Newton, of 66, Chancery Lane, in the co. of Middlesex, civil engineer, for "*Improved apparatus for generating and carburetting illuminating gas.*" A communication. May 18, 1871.

1783.—Albert Tibbitts, of 41, Lansdowne Crescent, Notting Hill, in the co. of Middlesex, gentleman, and Edward Fullwood, of 8, Newton Terrace, Lee, in the co. of Kent, cement manufacturer, for "*Improvements in paving streets and paving or covering other surfaces, and in compositions to be used for these purposes.*" July 7, 1871.

Price Current.

CASTINGS.—*Per Ton.*

Average Weight of Cast-iron Gas-pipes, per Yard.

1 in.	2 in.	2½ in.	3 in.	4 in.	5 in.	6 in.	7 in.	8 in.	9 in.	10 in.	12 in.
16	21	28	33	51	70	89	107	126	149	177	208 lb.

Retail Prices are 5 to 10 per cent. higher.	London.	Glasgow.	Newcastle and Middlesboro'.	Wales.	Yorkshire, Derbyshire, and Staffordshire.
	£. s. d.	£. s. d.	£. s. d.	£. s. d.	£. s. d.
Pig Iron, No. 1 (g.m.b.)	4 5 0	3 3 0	2 13 6	3 15 0	3 15 0
1½ and 2-inch Socket-pipes	7 10 0	6 10 0	6 7 6	6 15 0	7 0 0
2½ and 3-inch ditto	6 15 0	5 15 0	5 7 6	5 15 0	6 0 0
4 and 5-inch ditto	6 10 0	5 10 0	5 5 0	5 12 6	5 17 6
6 inches and upwards ditto	6 5 0	5 5 0	5 0 0	5 7 6	5 15 0
Retorts, 1st fusion, hot blast	6 0 0	5 0 0	4 15 0	5 10 0	6 0 0
Ditto, 2nd ditto, cold ditto	7 0 0	6 0 0	5 15 0	6 10 0	7 0 0
Tank-plates, ¼ thick and above	6 10 0	5 10 0	5 5 0	6 0 0	6 10 0

WROUGHT-IRON TUBING,

Subject to 60 per cent. Discount.

	2 in.	1¼ in.	1½ in.	1 in.	¾ in.	½ in.
	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.
Patent Welded Tubes, from 2 to 14 feet—per foot	1 8	1 1	0 10	0 7	0 5	0 4½
Ditto ditto, from 12 in. to 23½ in.—each	3 0	2 0	1 6	1 1	0 9	0 8
Long Screws, from 12 in. upwards	4 0	2 3	2 0	1 6	1 2	0 11
Bends and Springs	4 3	2 3	1 9	1 3	0 11	0 8
Square Elbows, equal or reducing; Round Elbows, 5 per cent. extra	3 9	2 3	1 9	1 3	0 10	0 8
Tees, wrought or cast	4 0	2 6	2 0	1 6	1 1	0 9
Crosses, ditto, equal or reducing	4 9	3 6	3 0	2 3	1 9	1 6
Iron Cocks	20 9	13 0	10 0	7 3	5 0	3 8
Ditto, with brass plug	28 0	16 0	13 0	7 0	5 6	4 6
Diminishing Sockets, Caps, Plugs, and Nipples	1 3	0 9	0 8	0 6	0 5	0 4½
Plain Sockets	1 0	0 8	0 7	0 6	0 4	0 3
Syphons, 2-quart	15 0	14 0	13 6	13 0	12 0	—

FREIGHTS.

Coastwise—Newcastle:—	Per Ton.	*Foreign.—*	Per Keel.
Chatham and Rochester	5s. 9d. to 6s. 0d	Barcelona	£20 0s
Cork	6 0	Bordeaux	9 10
Dover, Folkestone, & Ramsgate	5s. 3d. to 6 6	Boulogne and Calais	6 6
Dublin	6 0	Cadiz	12 10
Exeter Quay	9 0	Cronstadt	9 10
Ipswich	6 6	Copenhagen	8 0
London (from Leith)	7 6	Genoa	17 10
London (Pool)	6 0	Hamburg	8 10
Lowestoft and Yarmouth	5 0	Havre de Grace	10 0
Portsmouth & Southampton	8 0	Leghorn	17 15
Plymouth	8 0	Lisbon	10 5
Shoreham	7 6	Rotterdam	9 5
Whitstable	6 3	Stettin	10 10
Weymouth	8 0	Trieste	16 0
		Venice	21 0

SUNDRIES.

Best Newcastle Fire-bricks, per 1000	£2 10s. to £2 15s. 0d.
Cliff's Fire-bricks (at Wortley), per 1000	2 15 6
Ingham's ditto (at Wortley), per 1000	2 15 0
Farnley Iron Co.'s Fire-bricks (at Wortley), less discount	2 17 0
Fire-clay Retorts, per foot run	5s. 6d. to 0 7 6
Tarred Rope Yarn, per cwt.	1 0 0

GAS COALS.

Newcastle—Unscreened:—	Per Ton
Haswells, Nettlesworth Primrose, and South Pelaw	6s. 6d.
Felling, Framwell Gate, North Pelton, Redheugh Main, Walker's Primrose, West Wear, and Whitwell Primrose	7 6
Burnhope, Craghead, Charlaw, Derwent, East Castle, Edmondsley, Eighton Moor, Hartlepool Pelaw, Holmside, Lambton's Gas, Lanchester Pelaw, Medomsley, Mickley, New Pelaw, Pelaw Main, Ravensworth, Seaham, South Moor Pelton, South Leverson, Townley Main, Tyne Main, West Pelaw, Wearmouth Hutton, and Witton	7 0
Peareth, Ravensworth Pelaw, Waldridge, West Garesfield, and West Pelton	7 3
Brancepeth, Dean's Primrose, Londonderry Gas, New Pelton, Pelton, South Peareth, Stella, Urpeth, Washington Hutton, and West Leverson	7 6
Ramsay's Newcastle Cannel	17 6
Wigan Cannel (at Liverpool)	17 0

Scotch Cannel, f.o.b.:—	Per Ton.	*Scotch Cannel*, f.o.b.:—	Per Ton.
Boghead—at Bo'ness, 47s. 6d.; at Leith	48s. 2d	Arniston (at Leith)	21s. 0d
Muirkirk	27 0	Wemyss (at Wemyss)	20 0
Kirkness, best (at Burntisland)	22 6	Haywood Co.'s Haywood(at Granton)	21 0
Capeldrae, 1st quality (at ditto)	22 6	Pirnie, or Methill	17 0
Ditto, 2nd ditto (at ditto)	17 6	Lothian's Cannel (at Leith)	24 6
Cowdenbeath (at ditto)	12 0	Grange ditto (at Bridgeness)	17 6
Lochgelly (at ditto)	12 0	Kinniel ditto (at Bo'ness)	17 6
Donnibristle—at Burntisland, 12s.; at Aberdour	12 6	Myles' ditto	23 6
Auchinheath Lesmahago (at Granton)	27 0	Lochore Parrot (at Burntisland)	25 0
Duke of Hamilton's Lesmahago (at Granton)	27 0	Waverley Seam (at do.)	16 0
		Lanemark (at Glasgow)	16 0
		Elphinstone Tower (at Leith)	20 0

WEEKLY METAL REPORT.

(*From* J. Berger Spence & Co.'s *Circular.*)

Iron.—"Ayresome" Yorkshire pig iron steady. No. 1, 53s.; No. 2, 52s. 6d.; No. 3, 51s.; No. 4 (foundry), 50s.; No. 4 (forge), 50s., net cash, or 1s. extra four months. Scotch pig, 60s. 6d. to 61s. Welsh bars, £7 to £7 10s. Staffordshire bars, £8 10s. to £9. Hoop iron, £9 to £9 10s. Gas-tubes, 60 to 67½ per cent. off list. Boiler-tubes, 40 to 42½ per cent.——*Copper.*—Firm. English tough ingot, £75 to £76. Chili bars, £68 to £69.——*Tin.*—In demand. English ingot, £136 to 137. Straits, £132 10s. to £133.——*Tin-Plates.*—Coke, IC, 24s. to 25s.; charcoal, IC, 30s. to 32s. per box.——*Lead.*—Without alteration. Best English soft pig, £18 to £18 5s. Refined red lead, £20 10s. to £22.——*Antimony.*—French Star, £46 to £48.——*Spelter.*—Improved. Silesian, special brands, £18 10s. to £19; English, best brands, £18 15s. to £19.

TURNER & ALLEN,

201, UPPER THAMES STREET,

London,

GAS & WATER ENGINEERS.

CONTRACTORS FOR THE SUPPLY OF

LAMP COLUMNS, LANTERNS, FOUNTAINS, PIPES, &c.,

TO

GAS, WATER, & RAILWAY COMPANIES, LOCAL BOARDS, SHIPPERS, &c.

Complete Pattern and Price Book, 3s. 6d. post free.

Share List of Metropolitan Gas Companies.

Number of Shares issued.	Amount per Share.	Name of Company.	Amount paid up p. Share.	Dividend p. Cent. p. Annum.	Latest Quotations.
	£		£ s. d.	£ s. d.	£
8000	20	Anglo-Romano	20 0 0	10 0 0	20 — 22
5000	20	Bahia (Limited)	20 0 0	3 0 0	12½— 13
1000	20	Do., preference	20 0 0	10 0 0	24 — 25
750	20	Do., do., redeemable	20 0 0	10 0 0	21 — 23
40000	5	Bombay (Limited)	5 0 0	6 15 0	6½— 7
10000	5	Do., third issue	4 0 0	6 15 0	1½—1¾ pm.
10000	20	British (Limited) (Norwich, Hull-Seulcoates, Hanley, Tunstall & Shelton [Potteries], Trowbridge., and Holywell.)	20 0 0	10 0 0	35 — 36
7500	20	Cagliari (Limited)	20 0 0	7 0 0	20 — 21
112000	10	*Chartered*	10 0 0	8 0 0	16½— 17½
10000	10	Do., B shares, 4 per cent. max.	10 0 0	4 0 0	7 — 8
25000	10	Do., 5 per cent. preference	10 0 0	5 0 0	13½— 14
20000	10	Do., 5 per cent. preference, second issue	8 0 0	5 0 0	3½—3¾pm.
20000	10	Do., 10 per cent. preference	10 0 0	10 0 0	20 — 20½
17490	25	*Commercial*	25 0 0	10 0 0	44 — 46
20000	20	Continental Union	20 0 0	8 0 0	26 — 28
10000	20	Do., new	7 10 0	8 0 0	3½—4 pm.
5213	20	Do., preference (France: Strasbg., Cette, Nismes, Montargis, Vienne, Roanne, Beaucaire, Rueil, Albi. Italy: Milan, Genoa, Parma, Modena, Alessandria, Messina.)	20 0 0	7 0 0	26 — 28
5000	10	*Crystal Palace District*	10 0 0	10 0 0	17 — 17½
5000	10	Do., preference	10 0 0	6 0 0	12 — 13
6044	10	Do., new shares	10 0 0	7 0 0	13 — 13½
3956	10	Do.	1 0 0	7 0 0	1½— 1¾ pm.
23406	10	European (Limited)	10 0 0	11 0 0	16½— 16¾
12000	10	Do., new shares (Boulogne, Amiens, Rouen, Caen, Havre, & Nantes.)	5 0 0	11 0 0	3½—3¾pm.
5000	10	Hong Kong (Limited)	10 0 0	10 0 0	13½— 14½
1560000	100	*Imperial*	100 0 0	10 0 0	178 —178
26000	12½	Do., new shares	12 10 0	7 0 0	16½— 16¾
25000	12½	Do., new shares, 1870	5 0 0	7 0 0	2¾—3¼ pm.
1300	100	Do., bonds	£100	10 0 0	190 —195
56000	50	*Imperial Continental* (Amsterdam, Berlin, Ghent, Hanover, Lille, Rotterdam, Aix-la-Chapelle, Antwerp, Bordeaux, Brussels, Cologne, Frankfort-on-Maine, Haarlem, Stolberg, Toulouse, & Vienna.)	43 15 0	9 2 6	72 — 74
400	100	Imperial Mexican (Limited)	100 0 0	nil.	
200	100	Do., new	100 0 0	nil.	
3000	40	*Independent*	40 0 0	10 0 0	68 — 70
3000	10	Do.	10 0 0	5 0 0	8 — 9
3000	20	Do.	17 0 0	7 10 0	4 —5 pm
250000	8k.	*London*	100 0 0	10 0 0	175 —178
24000	8k.	Do., 1st preference	100 0 0	6 0 0	120 —122
	8k.	Do., 2nd preference	100 0 0	6 0 0	
	8k.	Do., 3rd preference	100 0 0	6 0 0	
£18781	100	Do., 1st preference stock	100 0 0	6 0 0	121 —123
£11828	100	Do., 2nd preference stock	100 0 0	5 0 0	103 —105
		Nictheroy, Brazil (Limited)			
15000	5	Malta and Mediterranean (Limited)	5 0 0	5 0 0	4 — 4½
6000	5	Do., preference	5 0 0	7 0 0	5⅞— 5¾
20000	5	Mauritius (Limited)	2 0 0	6 0 0	2½— 2¾
30000	5	Oriental (Calcutta)	5 0 0	10 0 0	7⅞— 8
30000	5	Do., new shares	2 10 0	10 0 0	1¼—1½ pm.
10000	5	Ottoman (Limited)	5 0 0	nil.	2 — 2¼
14000	10	Pará (Limited)	10 0 0	8 0 0	10¾— 11½
27000	20	*Phœnix*	20 0 0	10 0 0	35½— 36½
3600	100	Do., new	40 0 0	7 10 0	57 — 59
144000	8k.	Do.	100 0 0	5 0 0	57 — 59
5000	20	*Ratcliff*	20 0 0	10 0 0	33 — 35
	20	Rio de Janeiro (Limited)	20 0 0	10 0 0	34 — 35
6959	5	Singapore (Limited)	5 0 0	6 0 0	
2000	5	Do., preference	5 0 0	7 10 0	
1500	32½	Shanghai	32 10 0	12 0 0	
4000	50	*South Metropolitan*	50 0 0	10 0 0	88 — 90
4000	12½	Do.	12 10 0	10 0 0	21½— 22½
20000	12½	Do., new shares	2 10 0	10 0 0	5⅛—5⅜ pm.
15000	10	*Surrey Consumers*	10 0 0	10 0 0	17½— 18½
10000	10	Do., new	6 0 0	10 0 0	5—6 pm.
9000	4	United General (Limerick)	4 0 0	5 0 0	2½— 2¾
1500	10	*Wandsworth and Putney*	10 0 0	10 0 0	13 — 14
1500	10	Do.	10 0 0	7 10 0	7¼ — 8
1819	10	Do.	10 0 0	7 10 0	
1138	10	Do.	5 0 0	7 10 0	
20000	10	Western (Limited) A shares	10 0 0	10 0 0	17½— 18½
10000	10	Do., B shares	9 0 0	10 0 0	7 —8 pm.
10000	10	Do., C shares	9 0 0	10 0 0	7 —8 pm.
20000	10	Do., D shares	1 0 0	10 0 0	3¼—3¾ pm.
16000	5	*West Ham*	5 0 0	8 0 0	6¾— 7
10000	5	Do., new shares	1 0 0	8 0 0	1¼— 1½
551	10	West London Junction (Limited)	10 0 0	6 0 0	
520	10	Do., preference	10 0 0	6 0 0	

DUKE OF HAMILTON'S

LESMAHAGOW GAS COAL.

LESSEES:

LESMAHAGOW AND LONGLEE COAL COMPANY,

Office—5, DIXON STREET, GLASGOW.

Works—BLACKWOOD & SOUTHFIELD, LESMAHAGOW.

English and Foreign Agents:

JAMES MILLER, SON, & Co.,

1, GREAT ST. HELEN'S. LONDON, E.C.,

AND

75, UNION STREET, GLASGOW.

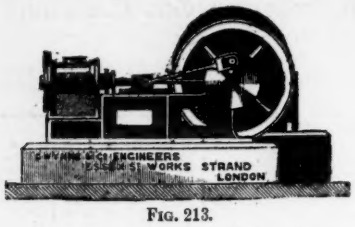


FIG. 213.

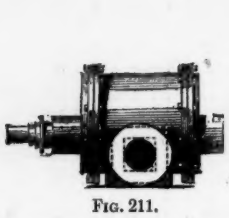


FIG. 211.

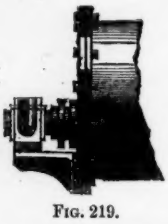


FIG. 219.

GWYNNE & COMPANY,

HYDRAULIC, MECHANICAL, AND GAS ENGINEERS,

ESSEX STREET WORKS, STRAND,

London, W.C.,

SOLE MANUFACTURERS OF

BEALE'S IMPROVED PATENT GAS-EXHAUSTER,

Under the personal superintendence of Mr. BEALE.

REDUCED PRICES AND INCREASED CAPACITY.

The Gas-Exhausters may be made with inside or outside bearing, as shown in Figs. 211 and 219.

The Slides now made by GWYNNE AND Co. are on the lap principle, with considerable improvements. Two of the largest Gas-Exhausters belonging to London Companies are now being altered to this principle.

Fig. 213 shows the Improved Gas-Exhauster attached to, and driven by one of GWYNNE AND Co.'s well-known high-speed Horizontal Steam-Engines, without any intermediate gearing. This arrangement is extremely compact, and is beautifully adapted for small or large Gas-Works, and the foundations and erection are both very simple and inexpensive.

Prices and every information upon application to GWYNNE AND Co. *as above.*

DUKE OF HAMILTON'S

LESMAHAGOW GAS COAL.

The superior quality of this well-known Cannel, as wrought by

THE NITSHILL AND LESMAHAGOW COAL COMPANY,

Is now generally admitted by all Gas Engineers.

PRICE AND ANALYSIS MAY BE HAD ON APPLICATION TO

JAMES M'KELVIE, HAYMARKET, EDINBURGH.

THE FARNLEY IRON COMPANY, LIMITED,

FARNLEY, near LEEDS,

Possess special advantages for the prompt and efficient execution of large orders for

FIRE-CLAY RETORTS & FIRE-BRICKS,

Of every shape and size, and of the best quality; also for their *other productions* in Fire-Clay and Terra-Cotta, including their well-known White and Coloured GLAZED BRICKS.

The F. I. Co. have the exclusive right to make and sell Fraser's Patent "Ribbed" Retorts in Fire-Clay.

Apply as above, or at their Offices,

3, WESTMINSTER CHAMBERS, VICTORIA STREET, S.W., or at 46½, QUEEN STREET, HULL.

CAROLINE VICKARY,

(ADMINISTRATRIX TO THE LATE JOHN VICKARY,)

GAS ENGINEER, CONTRACTOR, IRON AND BRASS FOUNDER,

EXE ISLAND, EXETER,

(Established Thirty years,)

Respectfully tenders her thanks to those friends who have patronized her since her late husband's death, and having secured an efficient staff for each department of design and manufacture, she refers with confidence to works recently erected by her as a guarantee that all orders she may be favoured with will be completed in a sound and satisfactory manner.

GASHOLDERS AND TANKS,

Retorts, Retort-Fittings, Condensers, Scrubbers, Purifiers, Station-Meters, Governors, Sluice-Valves of all kinds. (Gas and Water Mains always in stock.)

GAS-FITTINGS,

Including Chandeliers, Pendants, Hall Lamps, Brackets, Star and Sun Lights of all designs, embracing the Mediæval and other periods.

GAS-METERS (WET OR DRY),

Combining the most recent improvements in principle and manufacture; upwards of 150,000 already in work, giving the highest satisfaction. (A guarantee for five years given with each one.)

Every description of **Plumbers Work,** comprising **Water-Closets, Beer-Engines, Lift and Force Pumps, Cocks for Gas, Water, or Steam, &c.**

Drawings, Specifications, and Estimates of **Gas-Works, Iron Roofs, Bridges,** and light or heavy structures in wrought or cast iron, supplied on application.

WANTED, by a young Man, aged 22, a situation as RENTAL CLERK in a Gas and Coke Company. Six years experience. Good recommendations.
Address J. G. G., care of Manager, Gas-Works, West Cowes, ISLE OF WIGHT.

ROSSENDALE UNION GAS COMPANY.

WANTED, an experienced and steady Man by the above Company, to take charge of the Company's Works, as SUB-MANAGER or FOREMAN. He must fully understand the manufacture and distribution of gas, setting of retorts, laying of gas-mains, &c. Salary £100 per annum.
Applications, enclosing testimonials, to be addressed to the Chairman of the Company, on or before Tuesday, the 3rd of October, at the Company's Offices, Bacup.
Sept. 18, 1871. WILLIAM BLACKLEDGE, Manager.

WANTED, a situation as Manager of Gas-Works making not less than 10,000,000 feet per annum, or ASSISTANT in larger works. Advertiser has a thorough practical knowledge both of the manufacture of gas and of the design and erection of new works, and is a good draughtsman. No objection to go abroad.
Address C. H. M., care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

TO GAS COMPANIES, ENGINEERS, CONTRACTORS, &c.

THE Advertiser seeks an engagement as MANAGER to a Gas Company, or to a Gas Engineer's and Contractor's establishment. Has been for many years superintending the erection of Gas-Works complete, with buildings, tanks, gasholders, apparatus, retort-settings, main-laying, gas-fitting, iron roofs, &c. Can provide drawings, specifications, estimates, &c. First-class testimonials. No objection to go abroad.
Address M. A. B., 8, Cuthbert Street, Hall Place, PADDINGTON, W.

GENERAL CLERK WANTED.

A Gas Engineer requires the services of a GENERAL AND OFFICE CLERK. One who understands Gas-Works and can get out working drawings preferred. Salary 30s. per week. Security required to the extent of £50.
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TO GAS COMPANIES AND OTHERS.

THE Advertiser is open for an engagement as MANAGER, to enter on duties after September next. He has now the management of a Gas-Work where the make of gas is over 30 millions annually.
Apply to A. D., care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

WANTED, a Second-hand Gasholder, to serve for a Tar-Tank. Apply, stating price and diameter, to G. BERRY, Engineer and Manager of Gas-Works, Ashford, KENT.

TO GAS MANUFACTURERS.

WANTED, to purchase the Ammoniacal LIQUOR of a moderate Gas-Work, to make Sulphate of Ammonia, on or near the premises, by a new process. Can be worked without inconvenience or annoyance. Please state quantity and price at the works, or free on rail.
Apply to A. B., care of Mr. Drapers, 5, Little Tower Street, LONDON, E.C.

FOR SALE, the entire Plant of a small Gas-Work, capable of making 30,000 feet per diem. Canal along side.
Apply to Mr. MEACOCK, Norwood Green, MIDDLESEX; or 15 and 16, GILTSPUR STREET, E.C.

TO CONTRACTORS FOR BUILDING AND PROPRIETORS OF GAS-WORKS.
PART OF GAS-WORKS PLANT FOR SALE.

TO BE SOLD, by private Contract, a portion of the present Plant or Apparatus now recently in use at the Spalding Gas-Works, consisting of a set of 4-in. CONDENSERS, and a set of 6-in. Condensers respectively, with traps all complete. A set of four 6-ft. PURIFIERS, with centre-valve and lifting apparatus and connexions, also all complete.
The whole of the above Apparatus is in excellent condition, fit for immediate use, and disposed of only in consequence of larger Condensers and Purifiers being required for the Spalding Works. To those who are engaged in constructing or altering Gas-Works, to which these Condensers and Purifiers are, in regard to size, adapted, this presents an opportunity not always to be met with, as the articles offered will be sold at a reasonable price.
For price and further particulars, apply to Mr. JOHN WOODWARD, Gas-Works, SPALDING.
Aug. 30, 1871.

A SAD STORY.

AN EARNEST APPEAL is made to the Gas World and others on behalf of the WIDOW and Three Infant Children of the late Mr. FREDK. RICHARDS, who lost his life by a fall of sand while engaged in putting in the syphons for a gas-tank at the Wilmslow Gas-Works on the 5th of August, he being at that time Engineer and Manager for the Company. His family, by this calamity, is left TOTALLY DESTITUTE.

Contributions will be received and duly acknowledged in the JOURNAL OF GAS LIGHTING, by T. G. BARLOW, Esq., C.E., 42, Parliament Street, WESTMINSTER, who has kindly consented to act as Treasurer.

A Committee has been formed to administer the Fund, consisting of the following gentlemen, either of whom will be happy to receive contributions:—

Dr. BOWER, Surgeon, Wilmslow.
Mr. W. MABON, Ardwick Iron-Works, Manchester.
Mr. ALFRED PENNY, Wharf Road, City Road, London.

Subscriptions already acknowledged		£97	16	6
Fletcher Murphy		2	2	0
M. B. Megson		1	1	0
J. Fletcher, jun.		0	10	0
F. J. Ommaney	Per W. Mabon and Co.	0	10	0
John Mabon, Mrs.		1	1	0
Robert Lawton		1	1	0
Henry Banks		1	1	0
E. C. Travis		1	1	0
J. J. Lord		0	10	0
R. Darney, Faversham		0	10	6
J. W. Young, Harrington		0	10	0
R. Morton, London Gas-Works		3	3	0
J. H. Robinson, Leamington		1	1	0
A. Robinson and Sons, Leicester		3	3	0
C. Tadman, Norwich		1	1	0
John Mudie, Burton-on-Trent		0	10	6
R. Harris, Bow Common		2	2	0
C. R. Mead, Reigate		2	2	0

ERRATUM.—In the last list of subscriptions, *for* "Thomas" *read* "Thomas Blocksaye."

PHŒNIX GASLIGHT and COKE COMPANY.
NOTICE is hereby given that the adjourned HALF-YEARLY GENERAL MEETING of PROPRIETORS, holding previous to the 30th of June last £300 paid-up capital and upwards in the said Company, will be held, pursuant to the Act of Incorporation, on WEDNESDAY, the 4th proximo, at Twelve for One o'clock, at the Bridge House Hotel, in the Borough of Southwark, for the purpose of declaring Dividends to the 30th of June last, and on other business.
The Transfer-Books will be closed on and after the 20th inst., and opened on the 5th proximo.
By order of the Court of Directors,
ISAAC ADOLPHUS CROOKENDEN, Secretary.
76, Bankside, London, S.E., Sept. 19, 1871.

PRIVATE TELEGRAPHS FOR GAS AND WATER WORKS.

THE Electric Telegraph Department of our business is most efficiently conducted by an experienced staff. CONTRACTS entered into for maintenance and erection of lines for Gas and Water Companies, private residences, hotels, &c. Bailey's simple A B C instrument is stronger and less liable to derangement than any other in the market. Price £6 per pair. Makers of maximum and minimum Electrical Indicators and Signals for Reservoirs. Water Pressure Recorders. Managers of Gas and Water Works are invited to ask us for our quotations, or for any information connected with Telegraphy.

Just published, 800 engravings, 4to., post free 2s. in stamps, weight 10 oz., cost of production £1000,

BAILEY'S Illustrated Inventions, containing details and prices of goods in our five several departments:—(1) Brass Foundry, Steam Gauges, Indicators, Feeders, and Fittings; (2) Engineers Sundries, Small Tools, and Stores; (3) Machine Pump and Fire Engine; (4) Turret Clock, &c.; (5) Electric Telegraph, A B C Instruments, Bells, and Apparatus.
J. BAILEY and Co., Albion Works, Salford, Lancashire.

FOR SALE, a quantity of Mouthpieces, for 15-in. Circular Retorts, with rising pipes, H and dip pipes, and hydraulic main. All in good condition, and recently thrown out of use at the Gas-Works, Boston, Lincolnshire.
Apply, for particulars, to the Company's Engineer, Mr. R. P. SPICE, 21, Parliament Street, WESTMINSTER, S.W.

FOR SALE, Four Purifiers of cast-iron, 6 ft. square inside, three shelves or grids in each of wrought iron. They are nearly new, being removed to be replaced by larger ones. Also a circular STATION-METER, capable of registering 5000 cubic feet per hour. Any reasonable offer will not be refused.
Further particulars may be obtained by applying to the MANAGER, Gas-Works, Newport, ISLE OF WIGHT.

ON SALE, a good second-hand Station-METER, 8000 feet per hour, West and Gregson make, bye-pass, &c.
Apply to W. LONGWORTH, Gas Offices, Dukinfield, MANCHESTER.

THE Richmond Gas Company are prepared to receive TENDERS for their TAR for the next Twelve months.
For particulars, apply to the undersigned,
JAMES ELDRIDGE, Manager.

RUGELEY GASLIGHT COMPANY.

TO BRICKLAYERS AND CONTRACTORS.

THE Directors of this Company are prepared to receive TENDERS for the excavating, buildings, puddling, mason and brick work required in the construction of a Brick GASHOLDER-TANK, at their Works.
Plans, specification, and form of tender may be seen upon application at the Company's Office.
Sealed tenders, addressed to the Chairman of the Directors, and endorsed "Tender for Tank," to be forwarded to the Secretary, Mr. MANNERS, on or before the 2nd of October next.
The Directors do not bind themselves to accept the lowest or any tender.
Rugeley, Sept. 14, 1871.

CLOTH Gas-Bags for Gas-Mains, as supplied to the Imperial, Chartered, and other London and Provincial Gas Companies. Suction and Delivery Hose, Leather Driving-Bands, and Stokers Gloves.
T. BUGDEN, Manufacturer, 79, Goswell Road, LONDON.

WILLIAM FOSTER, Analytical and Consulting Chemist, Gas Examiner to the Metropolitan Board of Works, late Senior Bell Scholar in Practical Chemistry in the School of Pharmacy, London.
The Analysis of Waters and other investigations conducted in connexion with Water and Gas Companies.
Experiments made in the Photometer for Makers of Gas-Burners, and questions connected with Gas Lighting investigated.
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MODERN STREET LIGHTING, by WILLIAM SUGG, A.I.C.E., price 1s. 6d., is now ready, and will be forwarded post free for 19 stamps.
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GMELIN'S CHEMISTRY.—Messrs. Harrison and Sons have the pleasure to announce the completion of the HANDBOOK OF CHEMISTRY, translated and edited by HENRY WATTS, B.A., F.R.S.
The concluding volume (the 18th) will be published in October.
An index to the entire work is in preparation, and will be ready in January, 1872.
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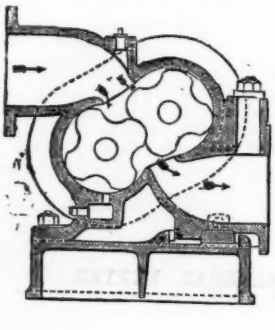
EDGE'S PATENT
FOR REMOVING THE
CARBONACEOUS INCRUSTATION FROM GAS-RETORTS.

"*Weymouth Gas-Works, Nov.* 8, 1870.
"Dear Sir,—I am pleased to bear my testimony to the efficiency of Edge's patent process for removing the incrustation from the Retorts. I have had it in use nearly two years, and have no thought of discontinuing it. By this process much labour is saved, and the Retorts are preserved in good working order for a much longer period than formerly, when they were frequently destroyed by the unskilful use of bars. The process is so simple and speedy, that a Retort will make more gas in a given time with a less quantity of fuel.—I am, dear sir, yours faithfully,
"THOMAS STONE, Manager.
"E. Goddard, Esq., Ipswich."
For particulars and terms, apply to E. GODDARD, Sole Agent, Gas-Works, IPSWICH.

LEETE AND EDWARDS,
SOLE MAKERS OF
FORBES'S PATENT ROTARY PUMP,



THE VERY BEST PUMP YET INTRODUCED FOR

TAR, OIL, AMMONIACAL LIQUOR, or WATER.

In use at several of the largest Gas-Works; also Oil, Tar, Sugar, and other Works in London.

FOR TESTIMONIALS AND PARTICULARS, APPLY AT

366 AND 368, EUSTON ROAD, LONDON, N.W.

MANUFACTURE AND DISTRIBUTION ACCOUNTS.

Mr. W. J. WARNER

Begs to say that in consequence of the number of inquiries he has received relative to the above form of Accounts, which he had the pleasure of submitting to the

BRITISH ASSOCIATION OF GAS MANAGERS,
AT THEIR LATE MEETING IN DUBLIN,

he has been induced to publish them, and is now prepared to supply the two sheets, post free, for 5s.

Applications to be made to

Mr. W. J. WARNER,
Engineer,
GAS-WORKS, SOUTH SHIELDS.

ALFRED LASS,
ACCOUNTANT,
28, NORTH STREET, WANDSWORTH, S.W.

Mr. Alfred Lass having had considerable experience in arranging, making up, balancing and auditing gas accounts, begs to inform the Directors of Gas Companies that he may be consulted on all matters relating thereto.
Balance-sheets prepared, Accounts audited, Consultations, Agencies, &c.

BOOKS FOR GAS ACCOUNTS.

ALFRED DOUBBLE & Co., 2, Serjeants INN, and 40, FLEET STREET, LONDON, make and supply all the various ACCOUNT-BOOKS as approved and adopted by Accountants, &c., to Gas Companies.
A complete set of the Books and Forms forwarded within a few days from receipt of order.

EDWARD SANDELL, Public Accountant and Auditor, 4, Skinner's Place, Size Lane, LONDON.
The projector of the *Original Gas Companies Analyzed Expenditure Account-Book* offers his experience and services in the examination, preparation, and production of all accounts in reference to Gas Companies. References if required.

SAMUEL PONTIFEX, Consulting Gas Engineer, having retired from the Great Central Gas Company, is now prepared to furnish PLANS and SPECIFICATIONS, as well as ADVISE Provincial Gas Companies as to the erection of new, or alteration and enlargement of existing works.
Offices: 22, Coleman Street, LONDON, E.C.

ALFRED PENNY, Gas and Consulting ENGINEER,
WENLOCK IRON-WORKS,
21, WHARF ROAD, CITY ROAD, LONDON.
Mr. PENNY having had a large experience in the construction, alteration, and management of Gas-Works, begs to inform the Directors of Gas Companies that he may be consulted on all matters appertaining thereto. He also manufactures Gasholders, Purifiers, and all the various apparatus used in Gas-Works, and keeps in stock Retorts and Mouthpieces, Socket-Pipes, Bends, Branches, and T-pieces, &c., &c.
Plans, Specifications, and Estimates prepared.

BRONNER'S PATENT GAS-BURNERS give 99 per cent. of light, as compared with 27 per cent. given by ordinary burners, with equal consumption of gas.—*Vide* "Gas Referees Report," published June, 1869.
HENRY GREENE AND SON, Sole Consignees of Brönner's Patent Improvements in Gas Lighting, 16 and 17, King William Street, E.C., and 138, Regent Street, LONDON.
Agents wanted.

JAMES OAKES & CO.,
ALFRETON IRON-WORKS, DERBYSHIRE,
AND
WENLOCK IRON WHARF, 20 & 22, WHARF ROAD, CITY ROAD, LONDON, N.,
Beg to inform Gas and Water Companies and the public, that they keep in stock in London all the CASTINGS in general use in Gas and Water Works, including Iron Retorts, Socket and Flange Pipes, Bends, Branches, and Syphons of all sizes, Lamp Columns, &c., &c.
N.B.—Orders for Cast-Iron Tanks, Girders, Columns, Cylinders, and all irregular castings, will have immediate attention. CHARLES HORSLEY, Agent.

BELGIAN CLAY RETORTS.

J. SUGG and CO., late ALBERT KELLER, GHENT.—The removal of the import duties on Earthenware permitting the entry of Clay Retorts into England, Messrs. Sugg, of Ghent, beg to draw the attention of the Gas Companies of London, and other Cities, to the very superior quality of the RETORTS manufactured by them. They can be made of any size, in one piece, and of any form. The price will be in proportion to the weight, and very moderate in comparison to their value.
Communications addressed to J. SUGG & CO., GHENT, will receive immediate attention.

INTERNATIONAL EXHIBITION, 1862.
CLASS X.
PRIZE MEDAL
For excellence of Fire-Clay Gas Retorts, and
"HONOURABLE MENTION" for
good quality of Fire-Bricks.
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NEWCASTLE-ON-TYNE.

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IMPROVED
WOOD SIEVES FOR GAS PURIFIERS.
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The above Sieves are used by the principal Gas Companies in London and the country. Their utility, durability, and cheapness combined, render them superior to all others.
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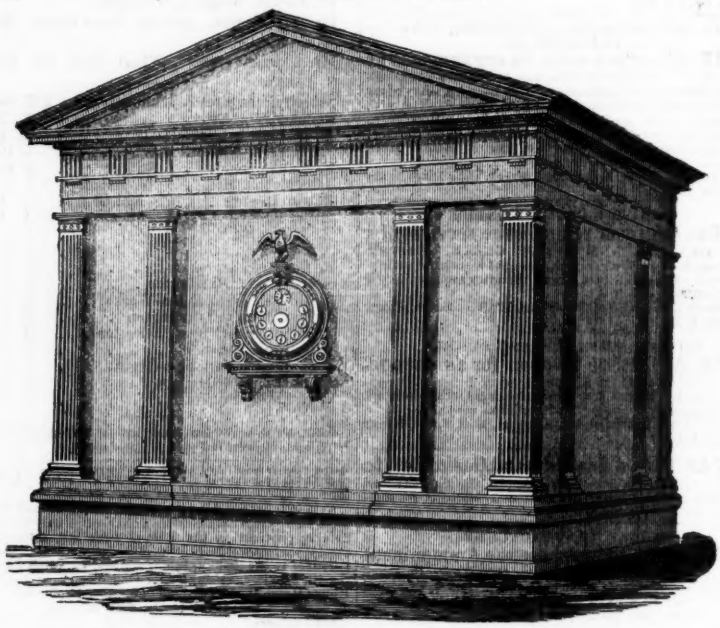
All orders punctually attended to, and estimates given if required.

J. & J. BRADDOCK,
GAS ENGINEERS,
GLOBE METER-WORKS, OLDHAM,
MANUFACTURERS OF
IMPROVED CONSUMERS GAS-METERS,
Of the best material and workmanship, carefully adjusted to the requirements of the British Sales of Gas Act and Foreign Standards of Measures.
PATENT FIXED WATER-LINE GAS-METERS,
Which are uniform with the ordinary Meters, and register with minute accuracy.
IMPROVED DRY GAS-METERS,
IN BEST TINNED IRON CASES.



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WITH PLANED JOINTS.
GOVERNORS, GAUGES, INDICATORS, EXHAUST-GOVERNORS, &c.
Home and Foreign Orders promptly attended to.
All Sizes of CONSUMERS METERS, STATION-METERS, and GOVERNORS generally in Stock.
Orders almost invariably despatched on the day of receipt.
TERMS, &c., ON APPLICATION.

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GAS ENGINEERS, EXETER,
Having completed their NEW WORKS in the COMMERCIAL ROAD, for the supply of every description of GAS APPARATUS, respectfully invite the attention of GAS COMPANIES and others to their various Manufactures, especially appertaining to GAS-WORKS.

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They have lately had the pleasure of ERECTING NEW GAS-WORKS and LIGHTING the following towns:—
Chagford, Holsworthy, and Northtawton, Devon; Chard and Chardstock, Somerset; Trecastle, Brecknshire; and Finchcox, Kent.
They have also executed many improvements and extensions at the following Gas Companies Stations:—BIDEFORD, DAWLISH, DEVONPORT, DARTMOUTH, EXMOUTH, ILFRACOMBE, LISKEARD, ST. AUSTELL, WELLINGTON, DUBLIN, BRECON, CARDIGAN, PONTYPOOL, TOTNES, TRURO, &c., to either of which they refer with much confidence, and the most satisfactory testimony will be given of the manner in which the various works have been executed.
TOWNS or VILLAGES not yet supplied can be lighted with gas at a moderate cost.
PLANS and ESTIMATES furnished and Gas Companies advised on improvements, extensions, and alterations of works.

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They beg special attention to the excellence and superiority of their DRY METERS, over 2000 being now in use by many of the largest Gas Companies in the West of England and South Wales. Warranted to measure correctly, and not to vary. Their acknowledged superiority has brought them into general use more rapidly than any Meters hitherto manufactured. A guarantee of Five years tendered with each Meter.

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An extensive variety of Choice Designs in CHANDELIERS, PENDANTS, BRACKETS, STAR and SUN LIGHTS, MEDIÆVAL FITTINGS for CHURCHES, &c.
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Now ready, demy 8vo, half bound roan, cloth sides, lettered, price 7s. 6d., by post 8s.,

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CONSISTING OF

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"An admirable plan. . . . Has the merit of simplicity."—*City Press.*

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Is guaranteed to prevent and arrest Rust on all Ironwork, and to cover Tar most effectually. It is most valuable for protecting it from the action of salt water, rain, sulphurous and gaseous exhalations. It has been well tested at various Gas-Works, in covering Tar on Gasholders, Purifiers, &c., and has given great satisfaction. Sample cans for trial sent free of charge. All communications to be addressed to

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PATENT PLATINUM

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Extract from Report by Dr. Letheby:—

"The results have been very remarkable, for they show an average increase of 63 per cent. on the illuminating power of the gas. I am of opinion, therefore, that the invention is of great practical value."

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Terms on application. N.B.—A specimen sent free on receipt of Twelve stamps.

*** Further testimonials from Drs. Frankland and Crooks, showing the great practical value of this invention, will be shortly published.

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Gas-Meter, Gas Apparatus, and Gas-Fittings Manufacturers,

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Station-Meters, Governors, Consumers Meters, Gas Lustres, Chandeliers, Brackets, &c., and every description of Gas-Fittings and Gas Apparatus.

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IMPROVED WET AND DRY CONSUMERS GAS-METERS,

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GOVERNORS, GAUGES, INDICATORS, EXHAUST & PRESSURE REGISTERS,

GAS STATION-METERS,

With all the joints planed.

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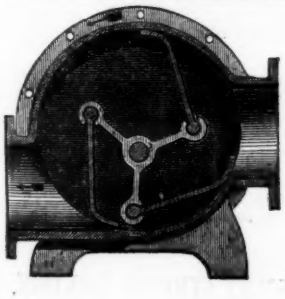

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GAS EXHAUSTER.

(From 250 Feet upwards per Hour.)

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ROTARY TAR AND OIL PUMPS.

For particulars and prices apply to the Patentee,

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CATHELS & TERRACE'S Patent Four-WAY DISC GAS-VALVE is the simplest and best Valve for Purifiers, and as a By-pass for other apparatus in Gas-Works. It is always gas-tight, and has no springs, ground faces, or other delicate parts. By it the flow of the gas cannot be accidentally stopped, and it never sticks.

For prices, &c., apply to the Manufacturers, Messrs. GUEST AND CHRIMES, Foundry and Brass Works, ROTHERHAM.

CATHELS'S Patent District Dry Gas-GOVERNOR is the only perfect self-acting contrivance for Regulating the Pressures in the higher levels of a district.

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Manufactory for every description of Casting and Machinery for Gas-Works and Water-Works.

Warehouse in London for Cast-Iron Pipes and Connexions of all sizes and in any quantity, Scott's Wharf, Bankside, Southwark.

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OXIDE OF IRON.—

We are prepared to supply, on moderate terms,

HYDRATED PEROXIDE OF IRON (BOG OCHRE),

Same quality as supplied by us to several of the most extensive Gas Companies, and which has given entire satisfaction.

FRANCIS RITCHIE & SONS,

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HOPKINS, GILKES, & CO.,

LIMITED,

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SUPPLY GAS & WATER PIPES of EVERY SIZE.

Plain, Turned and Bored, and Coated.

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Castings for Gas-Works of every description.

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Manufacturers of GAS-RETORTS, GLASS-HOUSE FURNACE & BLAST-FURNACE BRICKS, LUMPS, TILES, and every description of FIRE-BRICK.

Proprietors of

BEST GLASS-HOUSE POT and CRUCIBLE CLAYS.

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MANUFACTURERS OF

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THOMAS EDINGTON & SONS,

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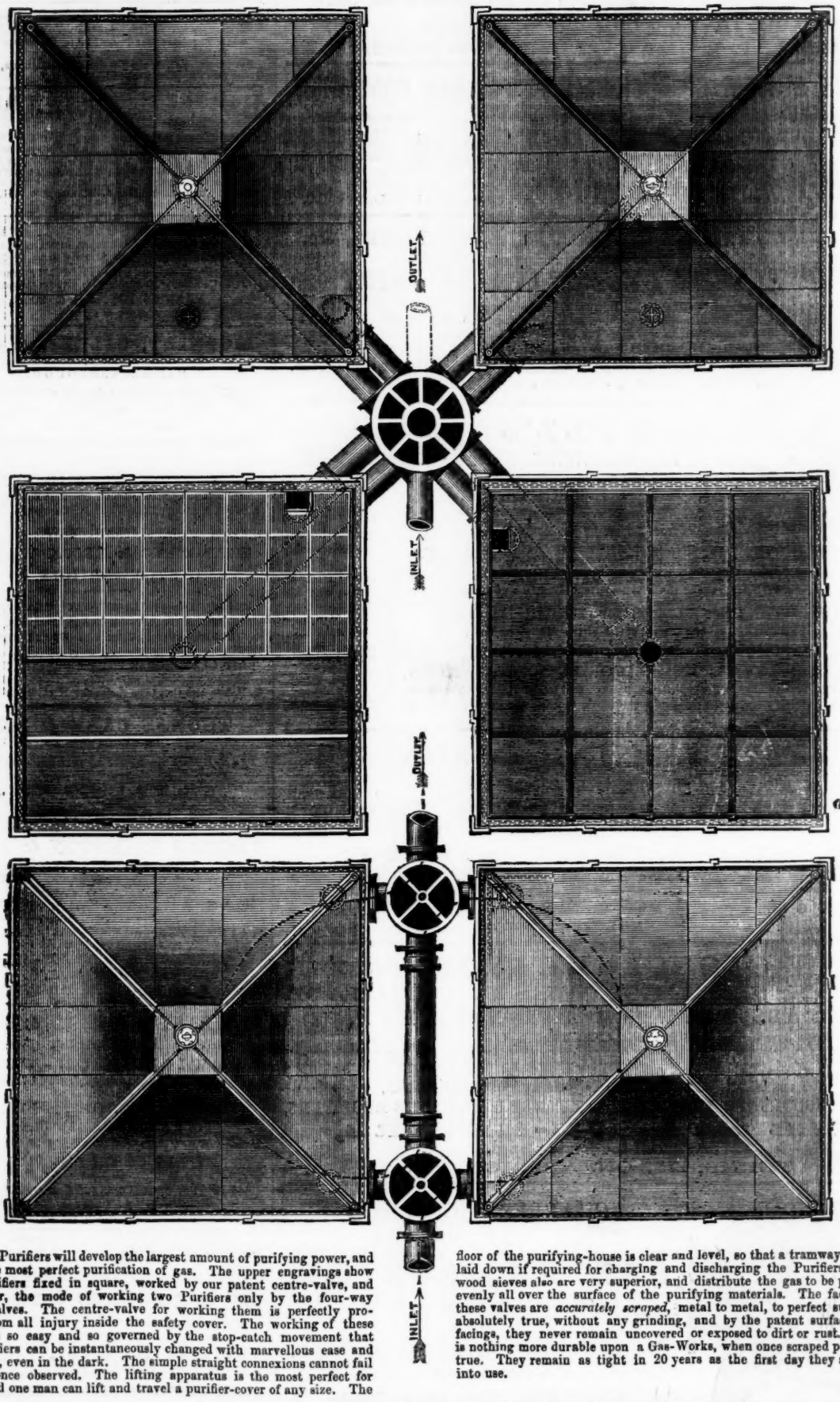
C. & W. WALKERS' IMPROVED PURIFIERS,

WORKED BY THEIR PATENT CENTRE-VALVES, &c.



These Purifiers will develop the largest amount of purifying power, and effect the most perfect purification of gas. The upper engravings show four Purifiers fixed in square, worked by our patent centre-valve, and the lower, the mode of working two Purifiers only by the four-way centre-valves. The centre-valve for working them is perfectly protected from all injury inside the safety cover. The working of these valves is so easy and so governed by the stop-catch movement that the Purifiers can be instantaneously changed with marvellous ease and certainty, even in the dark. The simple straight connexions cannot fail to be at once observed. The lifting apparatus is the most perfect for work, and one man can lift and travel a purifier-cover of any size. The floor of the purifying-house is clear and level, so that a tramway can be laid down if required for charging and discharging the Purifiers. The wood sieves also are very superior, and distribute the gas to be purified evenly all over the surface of the purifying materials. The facings to these valves are *accurately scraped*, metal to metal, to perfect surfaces, absolutely true, without any grinding, and by the patent surfaced bar facings, they never remain uncovered or exposed to dirt or rust. There is nothing more durable upon a Gas-Works, when once scraped perfectly true. They remain as tight in 20 years as the first day they are put into use.

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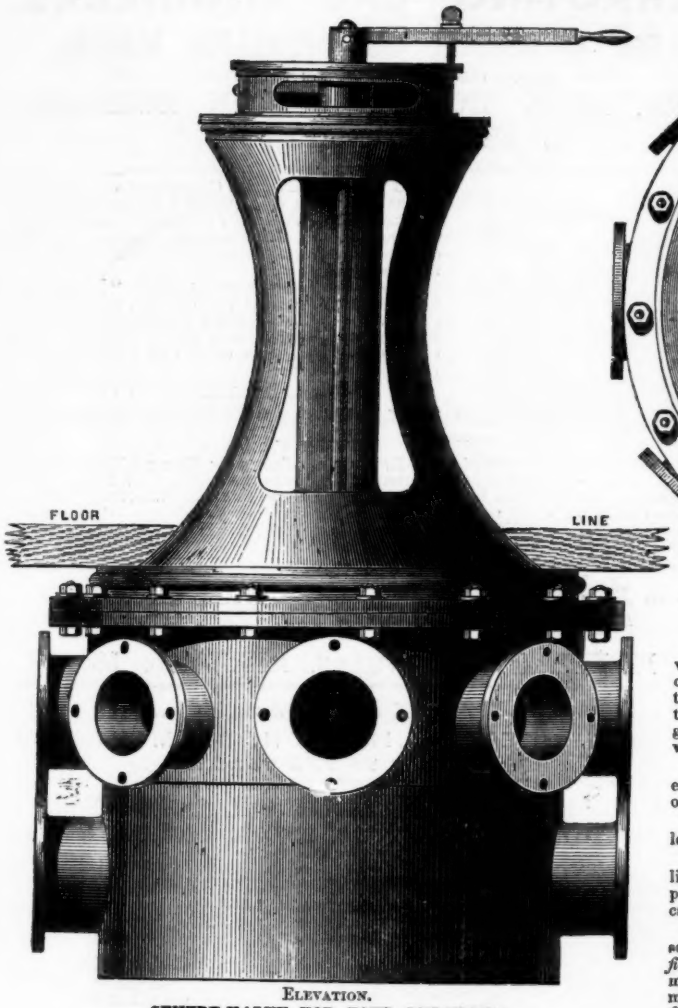
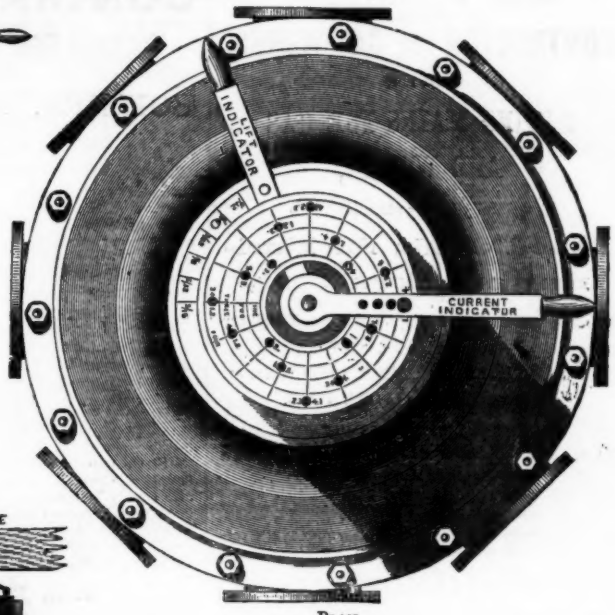
THE RECESSED CONE VALVE.

HOLLINSHEAD'S PATENT.



ELEVATION.

CENTRE-VALVE FOR FOUR PURIFIERS.



PLAN.

These Valves are adapted for every purpose and position about gas-works, &c. They are constructed on the principle of the ordinary plug-cock, the internal cones or plugs being formed with divisions, and both the cones or plugs and bodies of the Valves are *recessed* in such a manner that no part of the working surface is exposed to or in contact with the gas, *thus securing a minimum of friction*, and also the preservation of the working surface *from deposit or deterioration*.

They are provided with screw gearing for relieving the weight of and easing the plug while changing the Valve, so as to preclude the possibility of any sticking or straining.

The Centre Change-Valves and Bye-pass Valves for gas purposes, occupy less space than any other. All parts are easily accessible for examination.

The position of the Valve is changed so instantaneously that there is no liability, in the case of Centre Change-Valves for Purifiers, of impure gas passing forward into the holders during the time of changing, as is the case with Hydraulic Valves, and others used for the same purpose.

The Centre Change-Valves for Purifiers are for any number of Purifiers, so that the gas may be conducted *through the whole of the series of Purifiers*, commencing with any one of them, or shut off from any one or more at pleasure, thus enabling the whole of the purifying surface to be made available, passing the gas through any one, two, three, *or the whole four Purifiers* in succession, and in any desired order.

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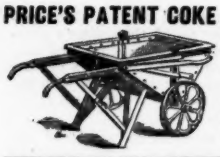

effecting a great saving of time, labour, and expense.

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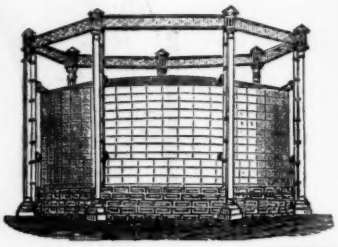

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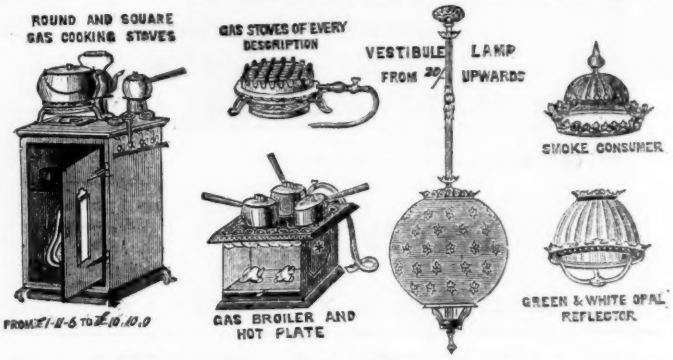
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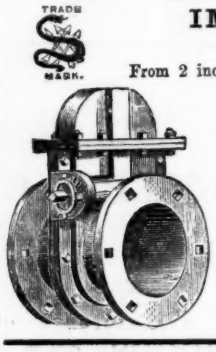

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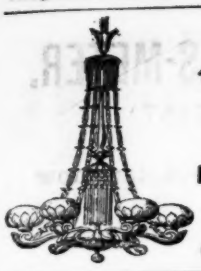

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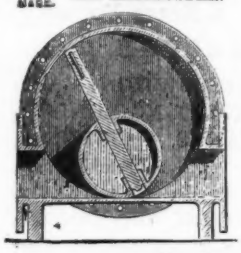

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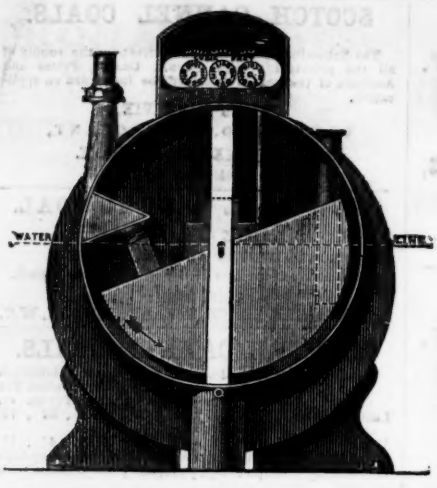

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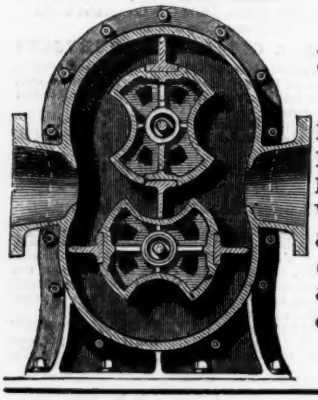

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